

STAR TREK
Voyager

Technical Manual



STAR TREK VOYAGER

TECHNICAL GUIDE V1.0

OR: "YES, BUT WHICH BUTTON DO I PUSH TO FIRE THE PHASERS?"

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FIRST SEASON EDITION

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ABOUT THIS DOCUMENT

The original *Star Trek: The Next Generation* Writers' Technical Manual was developed to provide a handy reference for the detailed technical background that our writers sometimes need, and was offered as a supplement to the Writers'/Directors' Guide. *It was NOT required reading — relatively few of our scripts used more than a tiny amount of this material.* Still, some story points did hinge on this stuff, and *Star Trek* has always prided itself on scientific accuracy and internal consistency.

Star Trek: Voyager will soon yield a similar document; this is but a prototype. As we proceed with the series, more information and artwork will be compiled and distributed. At this early stage, there is much specific data still unknown, still to be invented by the writers, producers, and designers. The basics are in place, however, a solid foundation left by the original *Star Trek* television series, the features, *The Next Generation*, and *Deep Space Nine*.

You may want to look over some of this material, be it due to a passing curiosity about phasers or a burning desire to fathom propulsive warp fields. Whatever the reason, it's here if you need it.

This document is divided into four major sections:

I. A Technical Primer. A handy alphabetical glossary of many *Star Trek* technical terms. If you need quick, simple answers to what something is, *this is the place to look*.

II. A Technical Introduction. This section touches briefly on most of the ship's major systems, with explanations on how things work and definitions of many key scientific terms. Most listings include a capsule "In Brief" description of the system, as well as more detailed background information, plus examples of how it is used in dialog.

III. Emergency Procedures. When bad things happen to good starships.

IV. A Celestial Bestiary. A collection of weird, sometimes dangerous, and scientifically semi-plausible phenomena which is offered here as a springboard for the writers' imagination.

We offered the writers a friendly reminder: Just because this stuff exists, it doesn't mean you *have* to use it in your script. To quote Gene Roddenberry, "Believability is the test. What do real people do and say? When a policeman picks up his .38, does he explain how it works? Do you know how the trigger levers work the firing pin and so on? All you need or really care to know is that when he uses it, you see it work, and you accept it." So why should the captain explain a phaser when she picks it up? *Star Trek* is about people, not about technology.

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SECTION I: A TECHNICAL PRIMER

A quick alphabetical reference to basic *Trek* tech. More detail on these subjects is available in the following sections, but in most cases, this is all you really need. Remember, this stuff is presented here in case you need it, but many of our best stories have used very little technical dialog, and the writer should not feel obligated to use all (or any) of this stuff.

Some terms and alien races are holdovers from *The Next Generation*; they are useful as background information.

antimatter: Matter which is exactly the same as normal matter, but with the opposite spin and electrical charge. When matter and antimatter come into contact with each other, both are annihilated with a tremendous release of energy. Antimatter is the primary power source of our ship's warp drive.

bearings: A term used to describe directions in space. It is usually used in the form: "The unknown spacecraft is at bearing zero-two-five, mark one-five."

biofilter: A device built into the transporter which scans for, and filters out many kinds of known hazardous bacteria and viruses. It is not effective against organisms for which it has not been programmed.

borg: One of the most dangerous entities in the Galaxy. The Borg is a collection of many life forms, joined by cybernetic implants to form a single group mind. The concept of the individual is alien to the Borg. As *Voyager* has been thrown into the Delta Quadrant, the home of the Borg, it is possible we will encounter them during the series.

bridge: The command center from which the captain controls the operation of *Voyager*. The main bridge is the prominent feature at the top of the ship's primary hull.

cloaking device: A mechanism which permits Romulan and Klingon starships to render themselves virtually invisible. A ship is not capable of firing its weapons while cloaked. Until DS9 acquired the USS *Defiant*, Federation starships did not have cloaking devices.

communicator: A tiny personal communications device worn as an emblem on Starfleet uniforms. This device lets our people talk to the ship when on an Away mission, and talk to each other when on *Voyager*, something like a voice-activated cellular phone.

computer: The *Voyager* main computer is tremendously powerful and very easy to use. In most cases, you can just verbally ask it a question, and it will either give you an answer in its spoken computer voice, or it will help you to clarify

your question so that it can find the answer. The actual main computer hardware is located in two computer cores located in the bowels of the ship.

Conn: Short for "flight controller." This is Tom Paris' control station on the bridge, directly in front of the captain Janeway's chair. Conn is responsible for actually flying the ship, fulfilling both helm and navigation functions.

deflectors: Also called navigational deflectors. A focussed invisible force field which protects *Voyager* against natural hazards in space; can be modified for use against hostile attack.

deuterium: An isotope of hydrogen used as the primary fuel for both the warp and impulse engines. It is stored in a frozen "slush" state in large onboard tanks.

diagnostics: Pre-programmed troubleshooting procedures used to troubleshoot most ship's systems. When you want a thorough (but time-consuming) analysis, you ask for a "level one diagnostic." When faster (but less thorough) analyses are called for, "level two" through "level five diagnostics" are usually ordered. (Five being the fastest.)

dilithium crystals: The heart of our warp drive system, dilithium crystals control the powerful matter/antimatter reaction which permits our ship to travel faster than light.

disruptors: Powerful energy weapons which are the principal weaponry of the Klingons and Romulans. (Klingons and Romulans do not normally use phasers.) Other alien weapon types will undoubtedly be invented for *Star Trek: Voyager*.

Federation: The United Federation of Planets represents perhaps 150 different planets and colonies, of which Earth is one.

Federation Council: The United Federation of Planets is governed by the Federation Council, presumably composed of representatives of the member planets. The Council is led by a president.

Ferengi: The Ferengi are capitalistic in the extreme. Although they follow their own strict code of ethics, to an outsider this behavior can often seem sinister and underhanded.

galaxy: The Earth is located in the Milky Way Galaxy, a spiral-shaped group of about 100 billion stars. *Voyager* can explore only one tiny part of the Milky Way. There are many other galaxies in the universe, but they are so far away that even a nearby galaxy would take over a thousand years to reach at maximum warp.

hailing frequencies: Part of standard radio procedures when communicating with other Federation ships and planets. One will normally open hailing frequencies when attempting to establish a radio communications link.

headings: A term used to describe directions in space. It is usually used in the form: "Set a course for the Klingon Home World, heading two-six-five, mark three-two."



The great seal of the United Federation of Planets

holodeck: One of two large rooms on *Voyager* which uses sophisticated computer imagery to create incredible simulations of any environment in the computer's memory. Very popular for recreation as well as crew training.

impulse drive: The secondary propulsion system of *Voyager*, used for slower-than-light travel. Much slower than warp drive, impulse speed is normally used only within a solar system or in orbit around a planet.

isolinear chips: Small rectangles of colored plastic which are used to store information, much like we use computer disks today. On *Voyager*, isolinear chips will be augmented by neural gel-pack computer circuits.

Jefferies Tubes: Maintenance crawlways interspersed about *Voyager*, providing access to power, computer, environmental, and other equipment. Jefferies Tubes run both horizontally and vertically within the starship.

Kazon: A race of unpleasant rogues divided into two competing sects, the Kazon-Ogl and the Kazon-Sera, bent on pursuing *Voyager* for its technology.

Klingon Empire: The historic enemies of the Federation, now our allies through an uneasy alliance. The Klingon national character is highly aggressive, but with great emphasis on their traditional sense of honor and duty. The capital of the Klingon Empire is the planet Q'onoS (pronounced "kronos"), although Klingons almost invariably refer to it as "the Home World." The empire is governed by the Klingon High Council. B'Elanna Torres is half Klingon.

lifeboats: *Voyager* has thirty-six lifeboat (escape) pods which can be ejected in extreme emergency. Each pod can hold up to six people comfortably.

moon: A small planet or asteroid which orbits a larger planet, much like our moon orbits the Earth.

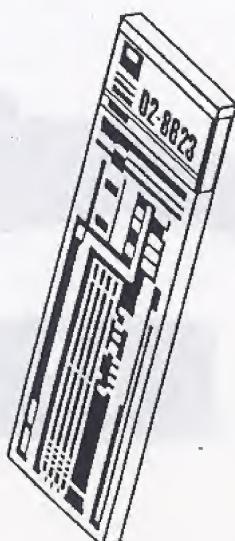
nebula: A very thin cloud of dust and gas in space.

neural gel-packs: An advanced type of fast computer circuitry which utilizes synthetic neural tissue to organize and process data more efficiently than standard isolinear chips. Gel-packs act as the "head end" of many computer devices aboard *Voyager*.

nova: A star which, from natural causes, experiences a sudden increase in brightness. Stars experiencing an explosive increase are called supernovas.

Ops: Short for "Operations Officer." This is a control station on the bridge, to the port side rear of the captain's chair. Ops is responsible for coordinating the activities of the ship's many departments.

PADD: Personal Access Display Device. A small handheld gizmo used aboard *Voyager* for information access and display.



Isolinear optical computer chip

phaser, personal: The personal defensive sidearm of Starfleet. Comes in three styles, the small "Type I", about the size of a keychain, and the larger "Type II" unit, and much larger Type III rifle "compression" phasers. Shoots a laser-like energy beam at a target. Phasers can kill, but are normally set to "stun," which briefly renders a person unconscious. Phasers can also be set to heat, cut, or vaporize.

phaser, ship's: Artillery-sized weapons mounted on the exterior of *Voyager* and other Federation starships. They shoot a powerful laser-like energy beam; however, phasers can only be fired at sublight speeds (traveling at impulse). They cannot be used at warp velocities.

photon torpedo: A missile-like weapon fired from *Voyager*, used primarily against targets moving at warp speeds.

planet: A spherical celestial object in orbit around a star, much like our own Earth orbits our sun. Most planets are not

Personal Access Display Device (PADD from TNG)



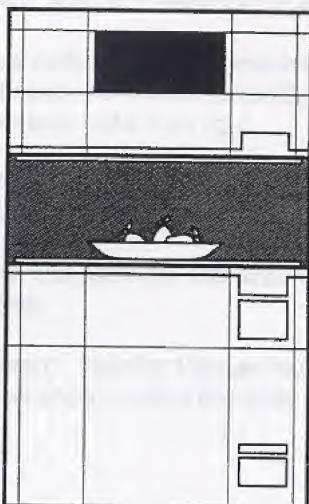
suitable for life, but for budgetary reasons, *Star Trek* stories tend to involve missions to "Class M" (Earth-like) planets.

quadrant: One quarter of the entire Milky Way Galaxy. *Voyager* has been thrown into the Delta Quadrant, on the other side of the galactic center. Quadrants are so big that they rarely figure into routine mission discussions. The term "sector" is used much more frequently.

replicator: A spin-off of transporter technology. This device creates near-perfect reproductions of small objects by using a molecular pattern stored in computer memory. Most food service on *Voyager* is provided by food replicators located throughout the ship. Replicator use on *Voyager* is severely limited by power availability. Neelix may take up the slack by setting up his own makeshift garden and kitchen.

Romulan Star Empire: Longtime enemies of the Federation, the Romulans seem bent on splitting the alliance between the Federation and the Klingon Empire. The Romulans are very cautious, always probing and testing before they

Food replicator terminal

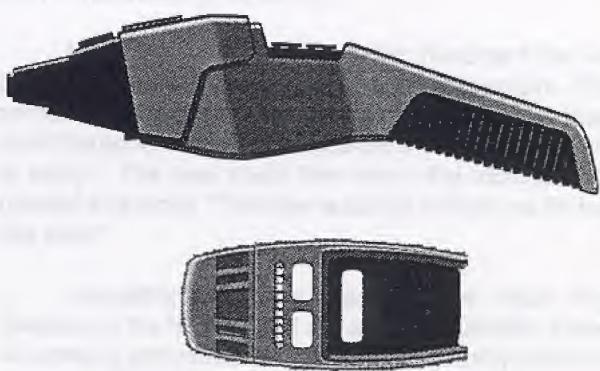


make a move. The principal planets of the empire are called Romulus and Romii. The leader of the Romulan Star Empire is called the "Praetor." *Voyager* may not ever encounter Romulans, but you never know.

sector: The galaxy is divided into four quadrants, and each quadrant is further subdivided into many, many thousands of sectors. A typical sector takes about five days to cross at warp 9. Most sectors are usually named for their major star systems or planets, as in the Sol sector, in which Earth is located.

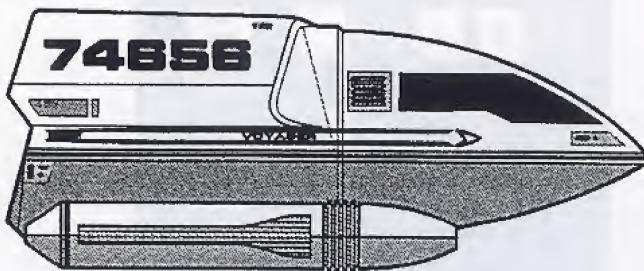
sensors: Sophisticated scientific instruments which can detect and analyze just about anything a writer needs. Sensor readings are typically displayed on control panel screens, or one can verbally ask the computer to report on what has been detected.

shields: Defensive force fields which protect *Voyager* against hostile attack as well as natural hazards in space.



Personal phasers

shuttlecraft



shuttlebay: The large facility at the aft end of *Voyager* used for shuttle launches and recovery.

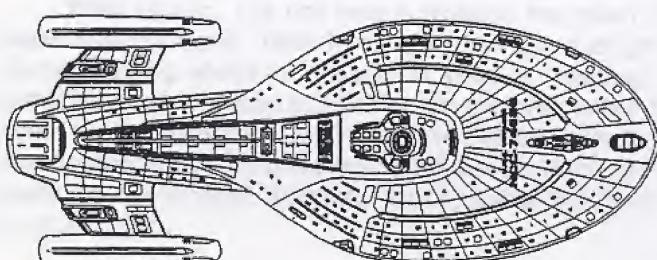
shuttlecraft: A small ship, about the size of a van, capable of carrying about six to eight people on relatively short trips (typically within a solar system).

shuttlepod: A smaller version of our shuttlecraft, capable of carrying two people only.

star: A large, luminous celestial object, like our sun, which generates energy using thermonuclear reactions.

starbases: Starfleet support facilities located throughout Federation space. Some starbases are on planetary surfaces, others are space stations. *Voyager* will not likely encounter any Starfleet facilities.

Starfleet: An organization chartered by the United Federation of Planets, dedicated to exploration, diplomacy, research, and defense. It is not primarily a military service in the 20th century sense of the term.



starship

starship: A space vehicle designed for travel in the vast distances between the stars. *Voyager* is an *Intrepid* class starship, the latest type commissioned by Starfleet.

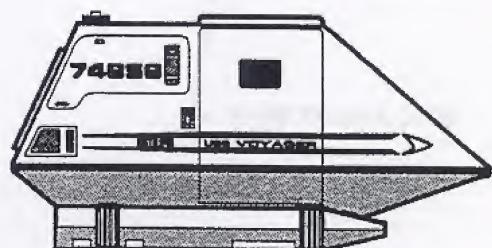
subspace radio: Radio communications which travel through the subspace continuum, permitting messages to be transmitted at speeds faster than light.

subspace: A spatial continuum in which *Voyager* travels when flying at warp speeds.

sun: The one particular star around which our home planet Earth orbits.

tractor beam: Used by *Voyager* to grab and tow small objects (like other ships) in close proximity to our ship.

shuttlepod

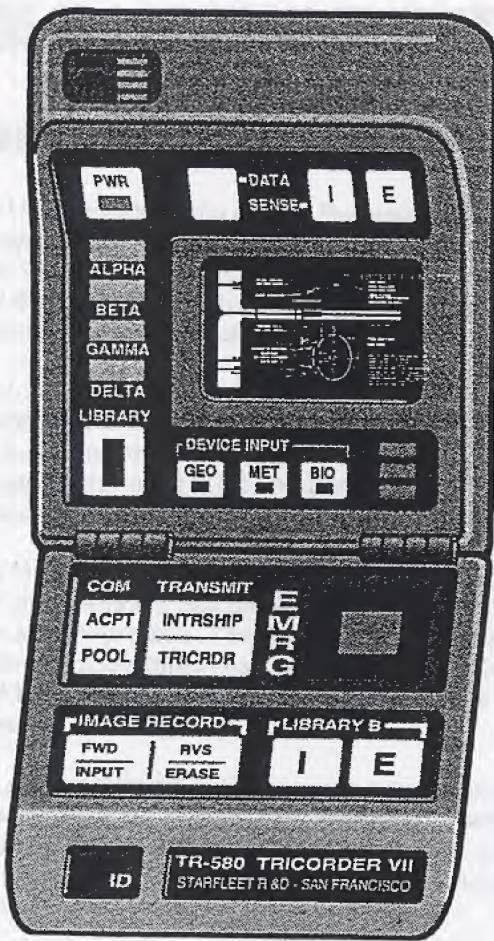


transporter: One of two rooms on *Voyager* which permits rapid travel from the ship to other places by converting a person to energy, beaming the energy to another location, then rematerializing the person.

tricorder: A handheld scientific instrument that lets our people analyze virtually anything a story might require. It is often carried by our people in a hip-mounted pouch. To use, it is pulled out of the pouch, opened, and pointed at whatever it is you want to study. The user might then study the tricorder's built-in readout and report, "Tricorder readings indicate no life forms in this area."

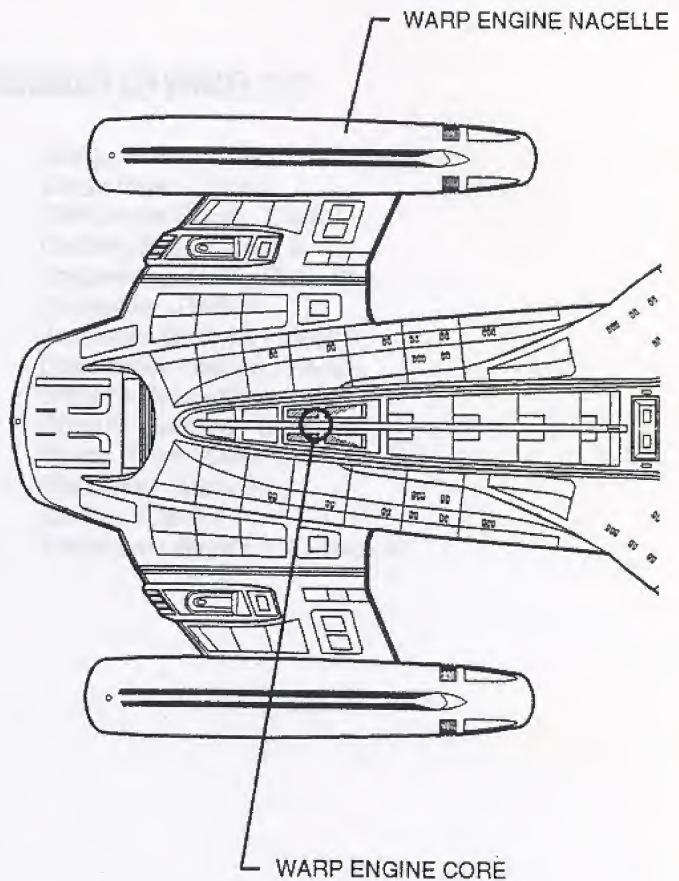
turbolifts: Elevators used to travel within *Voyager*. Because of the huge size of our starship, turbolifts travel both horizontally and vertically. Turbolifts are verbally controlled, for example: "Deck Four, Transporter Room Two."

United Federation of Planets: The Federation represents perhaps 150 different planets and colonies, of which Earth is one.



tricorder

Warp drive



universal translator: A computer program available in the *Voyager* main computer. This program can analyze almost any alien language form and translate it into English and vice versa. The universal translator does not work with all language forms, and it has been known to be somewhat unreliable in cases where there has been insufficient time for the computer to analyze the alien language form.

Warp factor: The unit used to measure the speed of faster-than-light travel. Warp factor one is the speed of light. Normal cruising speed for *Voyager* is Warp 6. Maximum sustainable speed is Warp 9.2. No ship can achieve a speed of Warp 10, the theoretical maximum. Even at the incredible speeds afforded by warp drive, Federation space is still some 75 years away for *Voyager*. Returning home by normal warp travel is not an option.

warp drive: The main propulsion system of *Voyager* and most starships. This system enables our ship to travel faster than light, necessary because of the incredibly vast distances between stars. The *Voyager* warp drive is powered by a matter/antimatter reactor, controlled by dilithium crystals.

SECTION II - A TECHNICAL INTRODUCTION

USS VOYAGER OVERVIEW

The *USS Voyager* is the newest Federation starship. It is an *Intrepid* class vessel, one of the fastest and most powerful in the Starfleet. It continues the tradition of exploration and discovery established by Captain James Kirk on the *USS Enterprise* nearly a century ago.

Much smaller than Picard's *Enterprise*, *Voyager* is 1130 feet long and weighs some one and a half million metric tons. The basic hull structure is fabricated from tritium/duranium alloys. *Voyager* was built at Starfleet's Earth Station McKinley, and was launched on Stardate 48038.5 (the year 2371).

The *Intrepid* class *Voyager* supports a complement of about 150 crewmembers and mission specialists who joined the ship for specific projects. The ship is capable of independent operation for about three years without refueling. Replenishment of both matter and antimatter tanks will be of major concern (see WARP DRIVE, p.12).

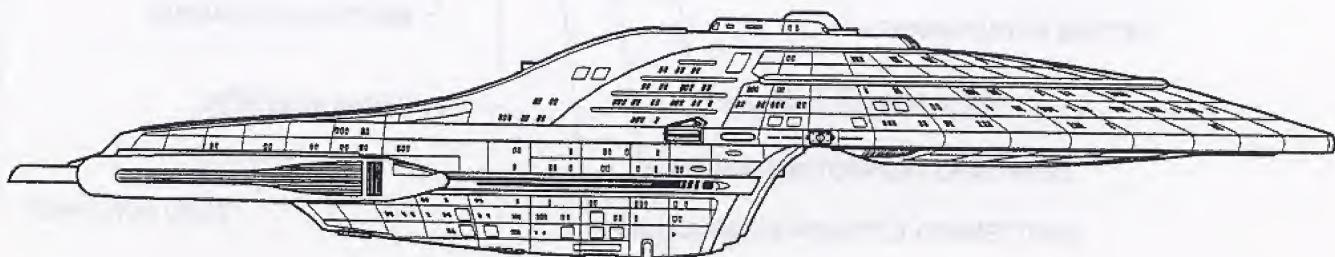
The original mission of *Voyager* was primarily exploration and research, and it was superbly equipped for both. For those occasions when a show of military force is unavoidable, the ship is equipped with an impressive array of defensive and offensive weapons.

Four *Intrepid* class starships may have been built to date by Starfleet. The first was the prototype *USS Intrepid*, after which the class was named. *Voyager* is conceivably the second operational ship in this class.

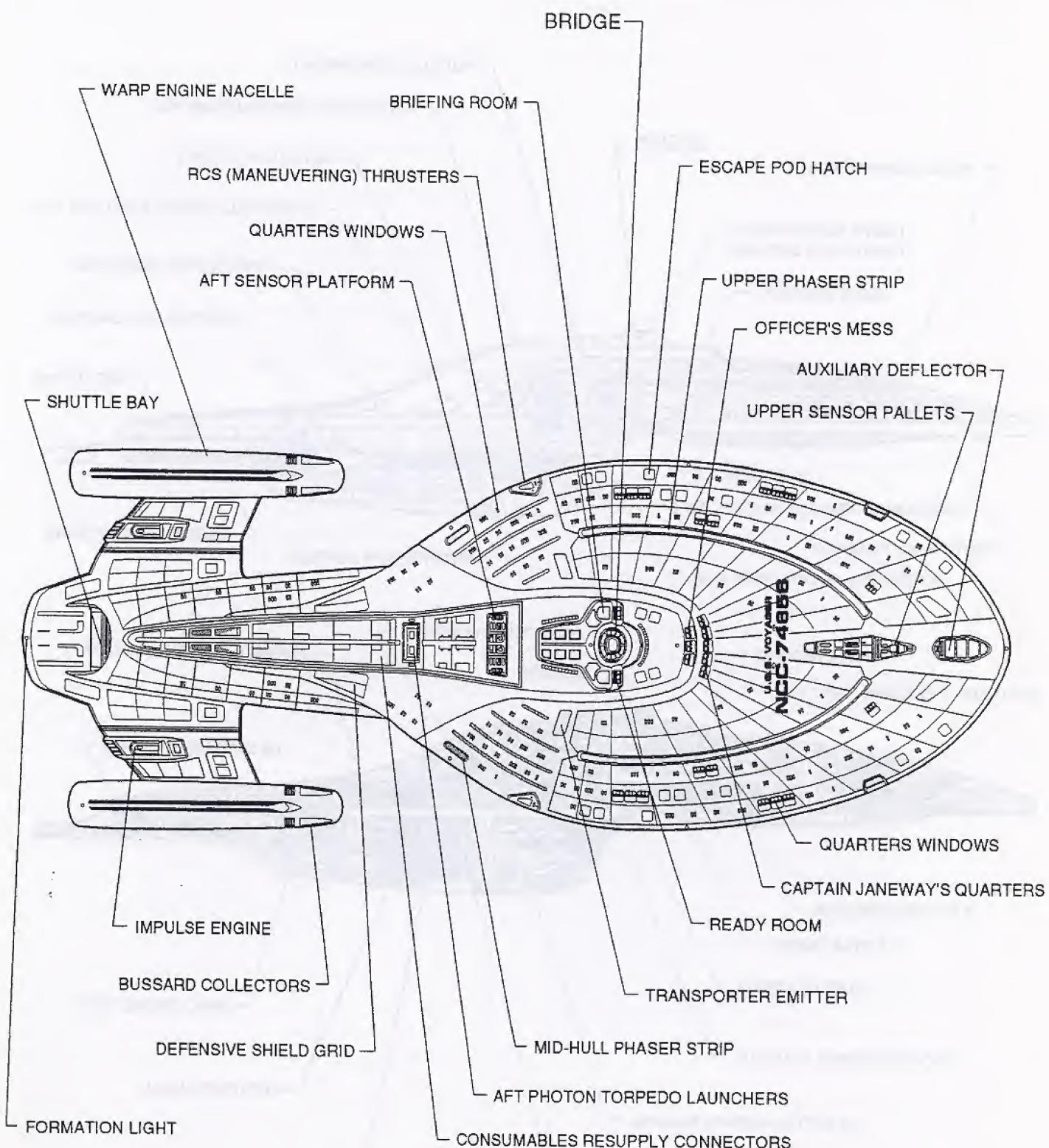
LOCATIONS OF KEY VOYAGER SETS

Bridge, Main- Deck 1
Cargo Bays - Deck 4
Conference Room - Deck 1
Docking Ports - Deck 8
Engineering, Main - Deck 11
Holodecks - Deck 6
Janeway's Quarters - Deck 3
Observation Lounge - Deck 1
Officer's Mess - Deck 2
Officer's Quarters - Deck 4-8
Ready Room - Deck 1
Shuttlebay - Deck 10
Sickbay - Deck 5
Transporter Rooms 1-2 - Deck 4

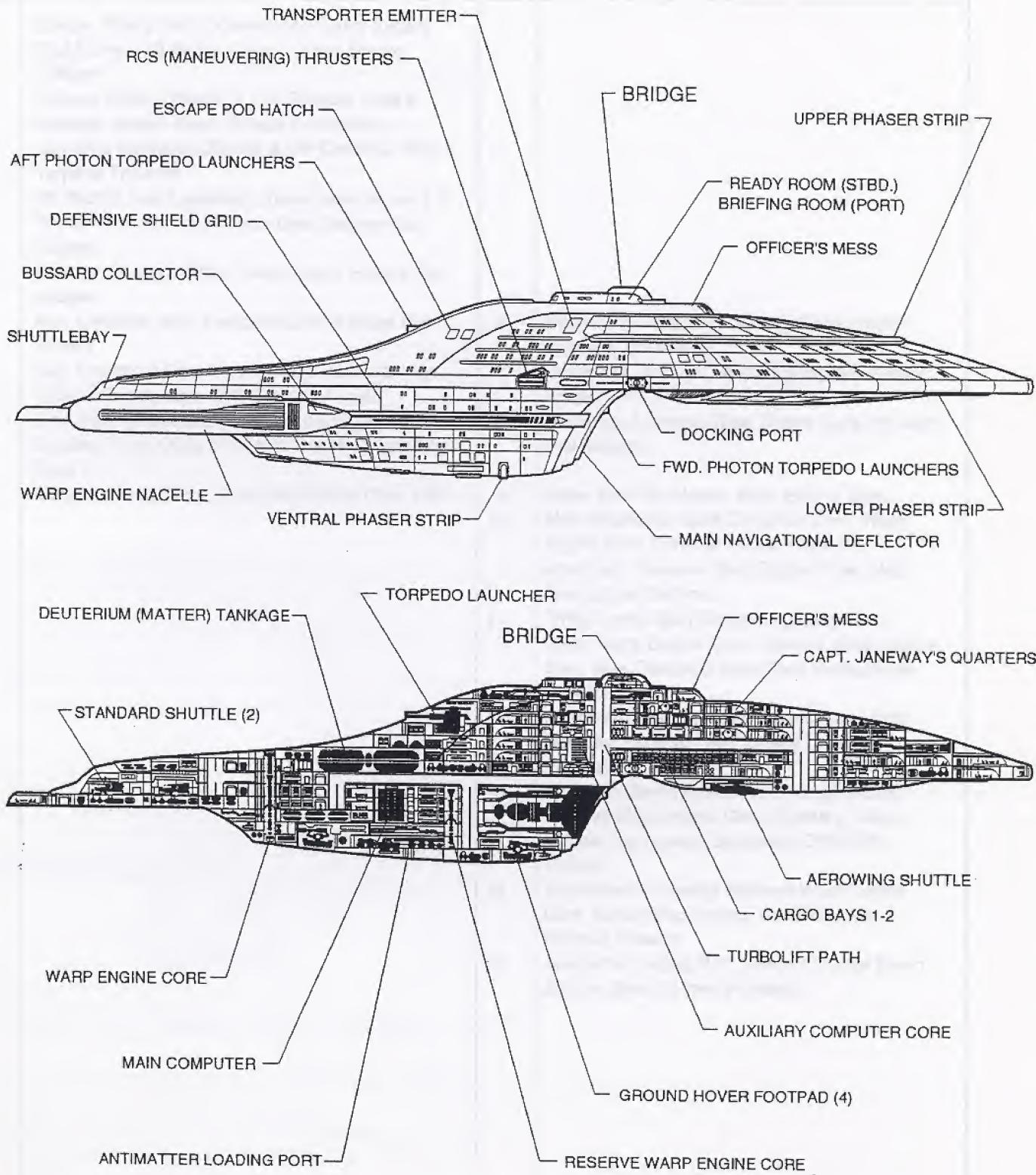
Starship Voyager-- NCC-74656



USS VOYAGER
NCC-74656
INTREPID CLASS



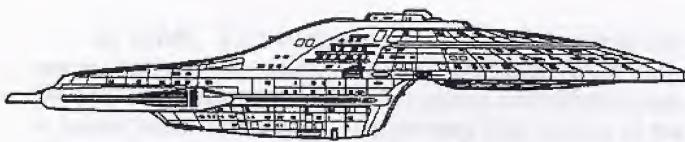
USS VOYAGER
NCC-74656
INTREPID CLASS



USS VOYAGER DECK BREAKDOWN

Deck	Primary Hull	Deck	Engineering Hull
1	Bridge, Ready Room, Conference Room, Escape Pod Access, Aft Bridge Airlock, Upper Sensor Platform	-	
2	Officers' Mess, Officers' & VIP Quarters, Labs & Storage, Sensor Gear, Escape Pod Access	-	
3	Captain's Quarters, Officers' & VIP Quarters, Photon Torpedo Trackers	-	
4	Aft Photon Torp Launchers, Transporter Rooms 1-2, Phaser Maintenance, Sensor Gear, Escape Pod Access	-	
5	Sickbay, Doctor's Office, Sensor Gear, Escape Pod Access	-	
6	Aux. Deflector, Aux. Computer Core, Escape Pod Access	6	Deuterium (Matter) Processing, Consumables Resupply Connectors
7	Aux. Computer Core, Upper Cargo Bays 1-2, Labs, Escape Pod Access, RCS Thruster Access	7	Deuterium Tankage, Warp Engine Core Injector Access
8	Deuterium processing, Port/Starboard/Forward Docking Ports, ODN/EPS Main Trunks, Lower Cargo Bays 1-2	8	Deuterium Tankage, Warp Engine Core, Aft Work Pod Storage
9	Cargo Loading Doors, AeroWing Shuttle Dock, Labs	9	Upper Main Shuttlebay, Warp Engine Core
		10	Main Shuttlebay, Main Computer Core, Warp Engine Core, Forward Photon Torpedo Launchers, Reserve Warp Engine Core, Main Navigational Deflector
		11	"Wing" Level: Main Engineering, Engineer's Office, Warp Engine Core, Reserve Warp Engine Core, Main Computer Core, Main Navigational Deflector
		12	Antimatter Tankage, Warp Engine Core, Main Deflector, Reserve Warp Engine Core, Escape Pod Access
		13	Aft Tractor Beam Emitter, Warp Engine Core, Reserve Warp Engine Core, Quarters, Labs, Escape Pod Access, Secondary ODN/EPS Trunks
		14	Antimatter Processing, Reserve Warp Engine Core, Escape Pod Access, Ground Hover Footpad Systems
		15	Antimatter Loading Port, Forward Tractor Beam Emitter, Ground Hover Footpads

Note: This is a listing of selected features only... *Voyager* is a large starship with a LOT of other stuff.



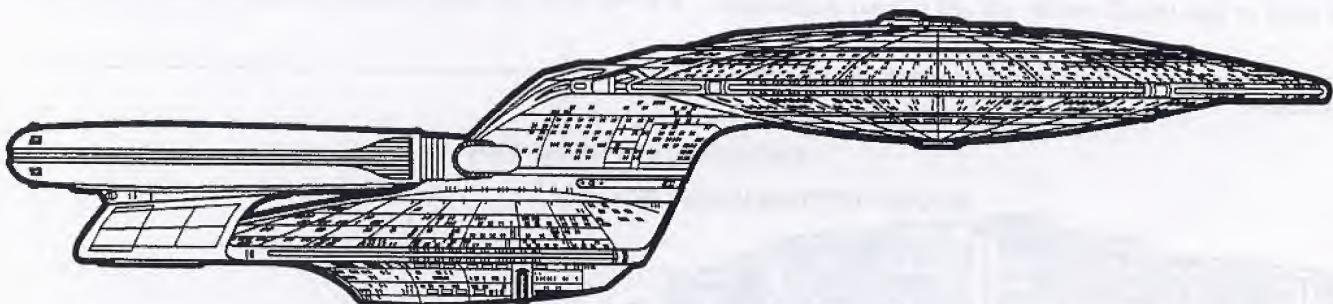
USS VOYAGER NCC-74656

Intrepid class Starship from *Star Trek: Voyager*

Length: 344 m. (1130 ft.) Crew: 150

Built at: Earth Station McKinley ca. 2371

Commanded by: Captain Kathryn Janeway



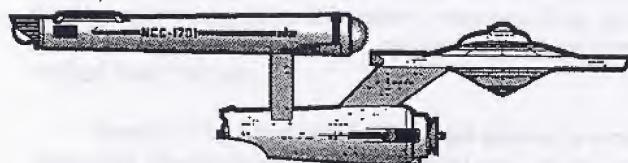
USS ENTERPRISE NCC-1701-D

Galaxy class Starship from *Star Trek: The Next Generation*

Length: 642 m. (2108 ft.) Crew: 1012

Built at: Utopia Planitia Orbital Construction Yards, Mars ca. 2363

Commanded by: Captain Jean-Luc Picard



USS ENTERPRISE NCC-1701

Constitution class Starship from *Star Trek* (original television series)

Length: 289 m. (947 ft.) Crew: 430

Built at: San Francisco Orbital Shipyards, Earth ca. 2245

Commanded by: Captain James T. Kirk

WARP DRIVE

In brief: To traverse the literally astronomical distances between the stars, *Voyager* employs WARP ENGINES. This system actually warps space, enabling the ship to travel faster than light. The primary fuel source of the *Voyager* warp engine is ANTIMATTER.

How to use it: The captain (or other commanding officer on the bridge) will normally give flight instructions, including speed, to Conn (the flight control officer). For example: "Set course for the Klingon Home World, warp factor six," or "Bring us to bearing zero-two-three, mark three-one-seven, warp nine."

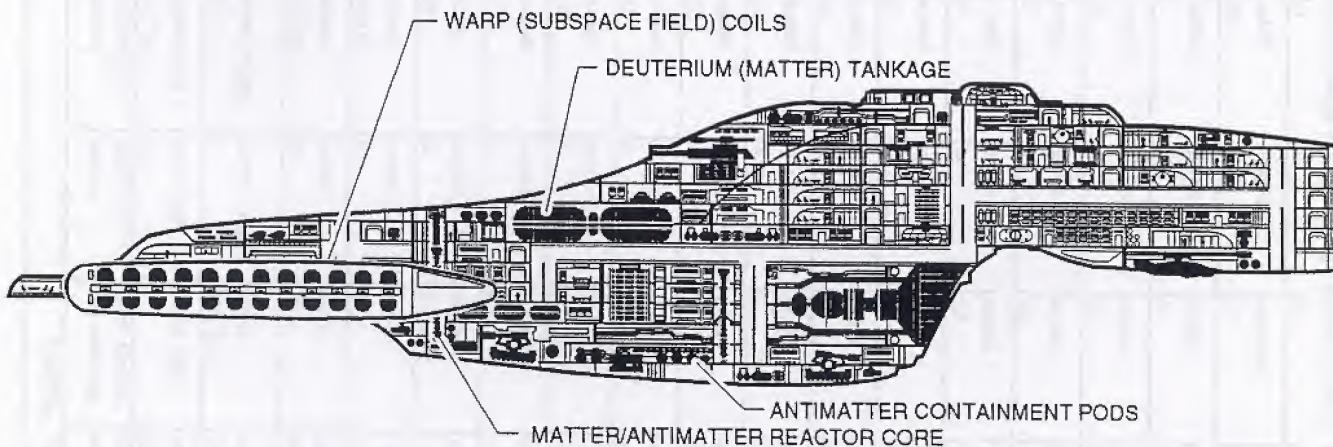
Warp speed: Warp Factor One is the speed of light. Higher warp factors are computed according to an asymptotic formula. Normal cruising speed of *Voyager* is Warp Six, about 392 times the speed of light. Maximum rated speed is

Dilithium Crystals: The matter/antimatter reactor includes a component called a Dilithium Chamber, which is used to "tune" the harmonics of the antimatter reaction. The dilithium chamber is a small drawer at the center of the antimatter reactor. This "tuning" enables the warp coils in the engines to generate the subspace field which makes warp speed possible. 24th century technology allows dilithium to be regenerated, so there is rarely a problem with these once-priceless crystals.

Voyager Update: Dilithium crystals are the essential "spark plug" of the ship's warp drive. If the ship's theta-matrix compositing system (to recrystallize "used" dilithium) is damaged, a burnt-out crystal may be a serious problem. The crew will be continually on the lookout for naturally-occurring dilithium, an extremely rare mineral found on very few planets and asteroids.

Warp Ten. This is the *absolute* speed limit of the universe. As Warp Factors approach 10, speed increases dramatically (sort of like the Richter Scale) and so does the

Warp drive



Warp 9.6 (1,909 times light speed), and the ship can exceed Warp 9.9 for only a few minutes. Under NO circumstances can *Voyager* or any other ship attain or exceed Warp 10. See the table on the next page for approximate travel times at various warp factors.

Power: The heart of the warp drive system is a matter/antimatter reactor in which deuterium plasma (hydrogen) is brought together with antimatter. This reactor is part of our Engineering set.

Antimatter: This refers to matter whose electrical charge and spin is opposite to that of "normal" matter. (For example, a proton — normally positively charged — would have a negative electric charge.) When matter and antimatter are brought together, they annihilate each other, releasing a tremendous amount of energy (as per Einstein's $E=mc^2$). Antimatter fuel is extremely volatile for this reason, and can only be stored in special magnetic containment pods which prevent the fuel from touching the rest of the ship.

required power. Warp 9.9 is over 50% faster than Warp 9.6, and Warp 9.99 is nearly triple Warp 9.9. (Subspace radio signals propagate at about Warp 9.999, about 100 times faster than Warp 9.6). Warp Ten is effectively infinite, and an object at that "speed" would occupy all points in the universe simultaneously.

Subspace: When travelling at warp speed, *Voyager* is actually suspended in a "bubble" of "subspace", which allows the ship to travel faster than light.

Variable Geometry Warp Nacelles: Because *Voyager* employs a new folding wing-and-nacelle configuration, warp fields may no longer have a negative impact on habitable worlds, as established in *TNG*.

Refueling: *Voyager* normally carries sufficient antimatter and deuterium for about three years of operation. Refuelling would have been accomplished at a starbase by means of a special-purpose tanker. Entire antimatter containment pods could be loaded through the external cargo bay

STARSHIP VOYAGER WARP SPEED CHART

SPEED		APPROXIMATE TIME TO TRAVEL										NOTES	
		Earth to moon	Across solar system	Between two nearby stars	Across one sector	Across Federation	Across entire Galaxy	Across entire Galaxy	Across Federation	Across entire Galaxy	Across entire Galaxy		
Standard orbit	6,000 Miles per hour	Number of times speed of light 0.000001 SUBLIGHT	250,000 miles 7,440,000,000 miles	5 light years	20 light years	10,000 light years	100,000 light years	1,120 light years	11.17 Billion years	223.33 Billion years	2,000,000 light years	To nearby Galaxy	
Full impulse (1/4 lightspeed)	167 Million	0.25 SUBLIGHT	5.38 seconds	44 hours	20 years	40,000 years	400,000 years	400,000 years	8,000,000 years	8,000,000 years	normal maximum impulse speed		
Warp factor 1	670 Million	1	1.34 seconds	11 hours	5 years	20 years	100,000 years	100,000 years	2,000,000 years	2,000,000 years	Warp One = SPEED OF LIGHT		
Warp factor 2	7 Billion	10	0.13 seconds	1 hours	6 months	3 years	992 years	992 years	198,425 years	198,425 years			
Warp factor 3	26 Billion	39	0.03 seconds	17 minutes	2 months	1 years	257 years	257 years	2,568 years	2,568 years			
Warp factor 4	68 Billion	102	0.013237368 seconds	7 minutes	18 days	2 months	98 years	98 years	984 years	984 years			
Warp factor 5	143 Billion	214	0.006291704 seconds	3 minutes	9 days	1 months	47 years	47 years	468 years	468 years			
Warp factor 6	263 Billion	392	0.003426342 seconds	2 minutes	5 days	19 days	25 years	25 years	255 years	255 years	5,096 normal cruising speed		
Warp factor 7	439 Billion	656	0.002049627 seconds	1 minutes	3 days	11 days	15 years	15 years	152 years	152 years	3,048 years		
Warp factor 8	686 Billion	1,024	0.001313313 seconds	39 seconds	2 days	7 days	10 years	10 years	98 years	98 years	1,953 years		
Warp factor 9	1,02 Trillion	1,516	0.000886870 seconds	26 seconds	1 days	5 days	7 years	7 years	61 years	61 years	1,213 years	normal maximum speed	
Warp factor 9.2	1.10 Trillion	1,649	0.000815726 seconds	24 seconds	27 hours	4 days	6 years	6 years	66 years	66 years	1,319 years		
Warp factor 9.6	1.28 Trillion	1,909	0.000704502 seconds	21 seconds	23 hours	4 days	5 years	5 years	52 years	52 years	1,048 years		
Warp factor 9.975	2.04 Trillion	3,053	0.000440499 seconds	13 seconds	14 hours	2 days	3 years	3 years	33 years	33 years	655 years	maximum rated speed can be maintained for 12 hrs.	
Warp factor 9.99	5.30 Trillion	7,912	0.000169966 seconds	5 seconds	6 hours	22 hours	1 years	1 years	13 months	13 months	253 years	nearly infinite power required	
Warp factor 9.9999	134 Trillion	199,516	0.000006740 seconds	0.20 seconds	13 minutes	13 hours	53 days	53 days	6 months	6 months	10 years	maximum speed of subspace radio (using booster relays)	
Warp factor 10	<infinite>	<infinite>	0	0	0	0	0	0	0	0	0	Warp 10 CANNOT be reached.	

doors (transporter loading is possible, but considered too dangerous because of the highly unstable nature of antimatter and the large mass involved). Now that *Voyager* is cut off from Starfleet, our antimatter supply is something we'll want to watch carefully. This may not be an immediate problem, but our heroes will probably have to find another source of antimatter in about three seasons. Conservation measures may lengthen this, but certain emergency situations may also cause us to run out earlier. The *Enterprise* warp drive system incorporated a device called a QUANTUM CHARGE REVERSAL DEVICE, also called an antimatter generator. *Voyager* may carry a *much* smaller unit than one carried aboard the *Enterprise*. The limitation here is that the spin reverser is extremely inefficient — it takes ten tanks of matter to get one tank of antimatter. Put another way, you can't get something for nothing - you always have to put more energy into a system than the useful work you hope to get from that system.

Other means of refueling: The front of the warp engine nacelles incorporates a set of powerful electromagnetic coils called a BUSSARD COLLECTOR. When the ship is travelling at high speed, these coils generate an electromagnetic field which collects stray atoms of interstellar hydrogen for use as fuel.

Other uses of warp power: When necessary, we can pull power directly from the warp core for applications which require massive amounts of energy. In the past, such situations have included applying warp power directly to the main deflector and using the warp fields for non-propulsive tasks. Such power usage is generally measured in WARP EQUIVALENT POWER comparisons, as in "we're feeding the main deflector with Warp equivalent power nine."

The major impact on *Voyager*'s attempt to get home: With the limited refueling and overhaul assets at their disposal, because of all calculated down times (mostly for engine cooling) and galactic distance involved, it could take anywhere from **200 to 400 years** for the starship to reach the frontier of the Beta Quadrant, the closest area of known space. The 75 year figure mentioned elsewhere assumed that the ship could maintain Warp 9.6 for that period of time, which we know will not be possible. Therefore, a true super-science solution will need to be invoked to bring our people back to familiar territory. It may be necessary to conserve power during long stretches of open galactic flight, between denser star groupings. We may need to dim the ship's lighting systems, and otherwise ration usage of power-intensive devices.

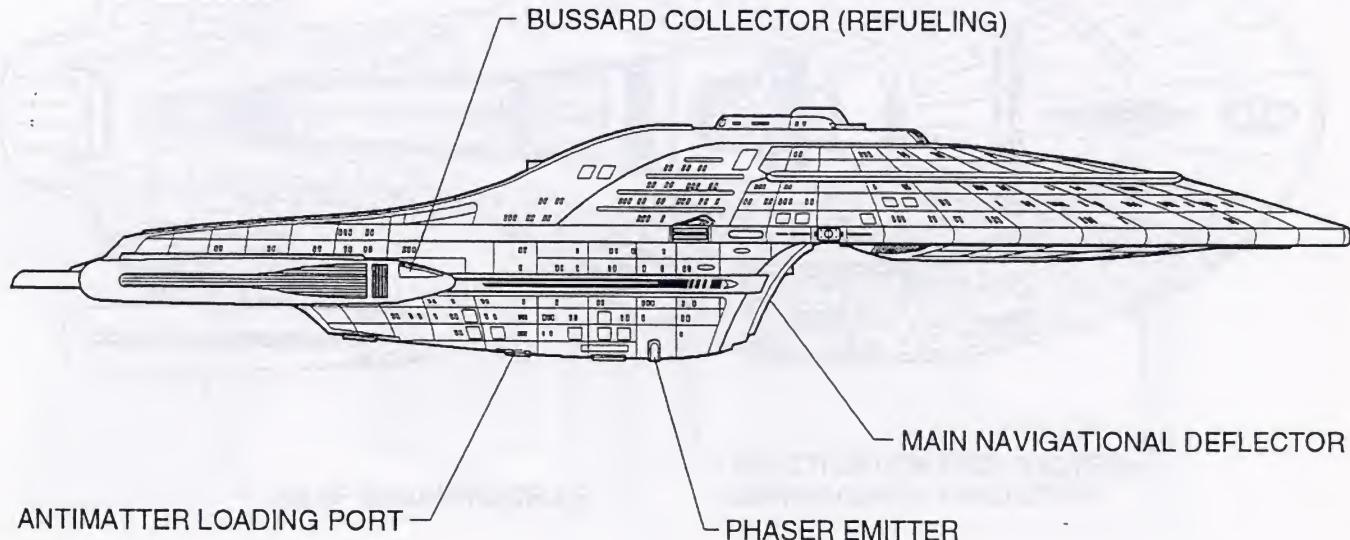
IMPULSE POWER

In brief: *Voyager* uses its IMPULSE POWER propulsion system for slower-than-light travel. The distances between the stars are so vast that impulse power is generally used only while in orbit or within a solar system. Impulse speed is *much* slower than warp travel.

How to use it: Impulse drive is often ordered by the captain with commands like: "Take us down to impulse speed for orbital approach," or "Accelerate to full impulse power."

Power: The impulse drive is powered by a series of FUSION REACTORS which are located in both aft wings on Deck 11. Another set of fusion reactors also provides auxiliary power to the starship to keep key systems operating when the warp drive and impulse reactors are inoperative.

Refueling and Selected High-Energy Devices



Fuel: The impulse fusion reactors are fueled by frozen hydrogen, (actually, a sort of a very cold ice slush) also called by its isotope name, DEUTERIUM.

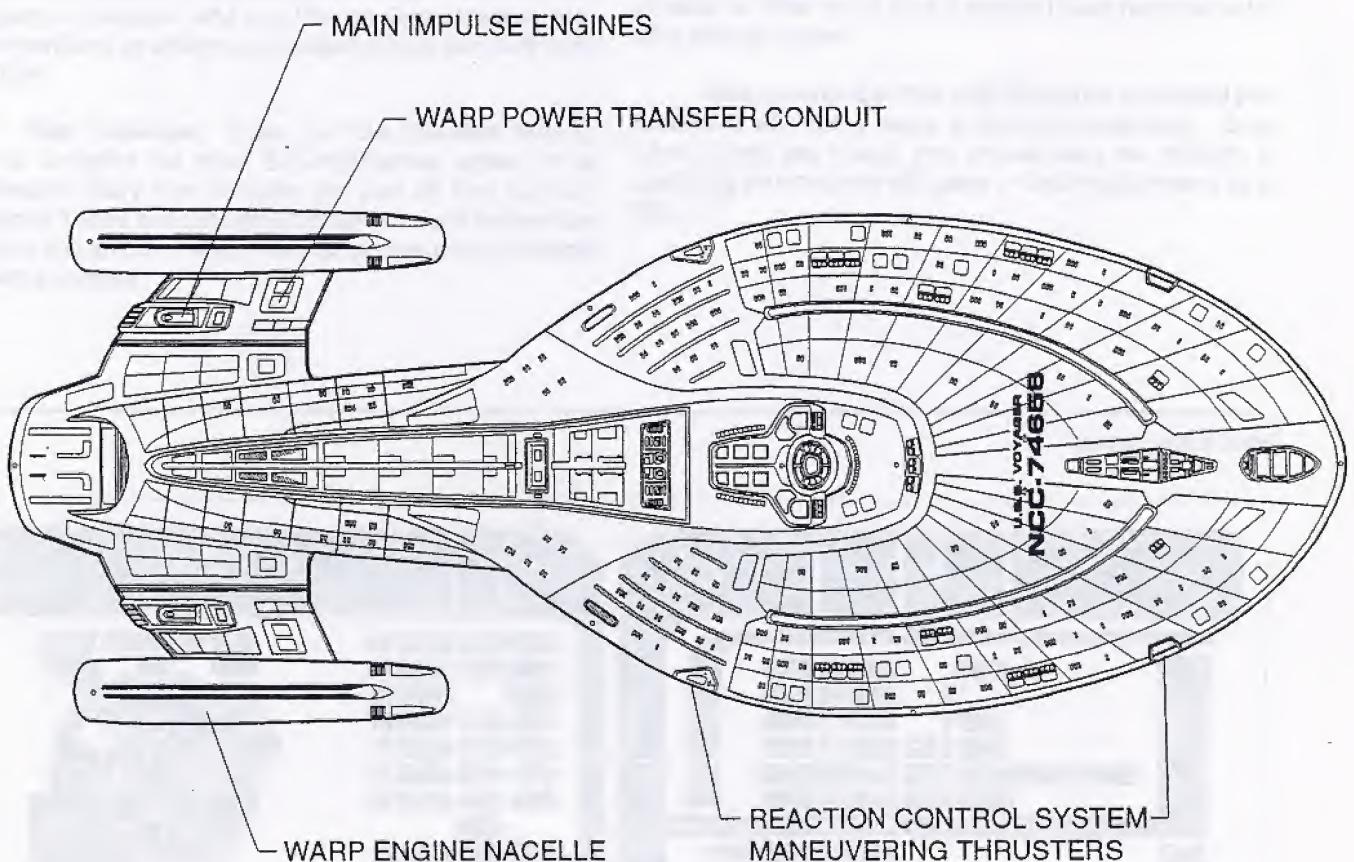
Speed: Normal maximum impulse speed is about one-fourth the speed of light. Greater sublight speeds are possible, but above this, it is considered more efficient to go to Warp drive. Note that although one-quarter lightspeed is extremely slow in interstellar terms, it is nearly 10,000 times faster than our present-day space shuttle. See the accompanying speed chart for approximate travel times. (Another problem with very high impulse speeds is that when you approach light velocity, you run into Einstein's relativistic time dilation, which can make storytelling rather messy.)

Speed terminology: When at sublight, it is rarely necessary to specify an actual speed. It is usually sufficient to specify "slowing to orbital velocity", "holding at station-keeping" (when you want to match the speed of another craft), or "accelerating to full impulse". On those occasions when it is necessary to specify an actual speed, these are usually expressed in fractions of the speed of light. Full impulse is "point-two-five light" or "quarter lightspeed". (Orbital velocity

is less than .00001 lightspeed.) Very slow speeds are expressed in terms of meters-per-second (as in "final docking approach... one-point-two meters per second.")

Notes on distances in space: Giving precise distances and speeds in dialog sometimes backs our visual effects staff into difficult corners. An example is a case when two ships are described as being 10,000 kilometers apart, and the dramatics of a scene requires both ships to be seen in the same shot. We've found that it's often best to use only enough numeric data to convey the aerospace/nautical "flavor" of the scene, but to otherwise fall back on relatively nonspecific statements such as "alien ship coming alongside."

Propulsion Systems



BRIDGE

In brief: The prominent bulge at the top of the saucer-shaped primary hull of *Voyager*. This is the command center from which all the starship's activities are coordinated.

Command area: At the center of the Main Bridge. Provides seating and information displays for Captain Janeway and First Officer Chakotay.

Conn: Short for "Flight Controller." This is Tom Paris' station, where he pilots the ship. It is a large stand-alone console located directly in front of the command area, and fulfills both helm and navigation functions.

Ops: Short for "Operations Officer." This is Harry Kim's station, located to the port aft side of the bridge. Ops is responsible for coordinating the activities of the ship's departments and for allocating resources such as power, sensor usage, and computer time.

Tactical: Responsible for weaponry, defense, and internal security, this is a small dedicated console directly behind the command area. In crisis situations, this console can be occupied by Tuvok or another tactical officer.

Aft stations: These are three special-purpose consoles which include Engineering, featuring a large cutaway diagram of *Voyager*, and two Mission Ops consoles. N.D. crewmembers as well as our principal officers can work these stations.

Side Consoles: These are four specialist stations. Tuvok occupies the main Security/Tactical station at aft starboard; Harry Kim occupies the port aft Ops console; B'Elanna Torres occupies the starboard forward Engineering station; and an N.D. crewperson can occupy the port forward Science console.

Notes on operating *Voyager's* control panels:

The most important thing to remember in using the control panels on the new starship *Voyager* is that they're very easy to use. Like certain brands of automatic cameras, they're so advanced, they're simple.

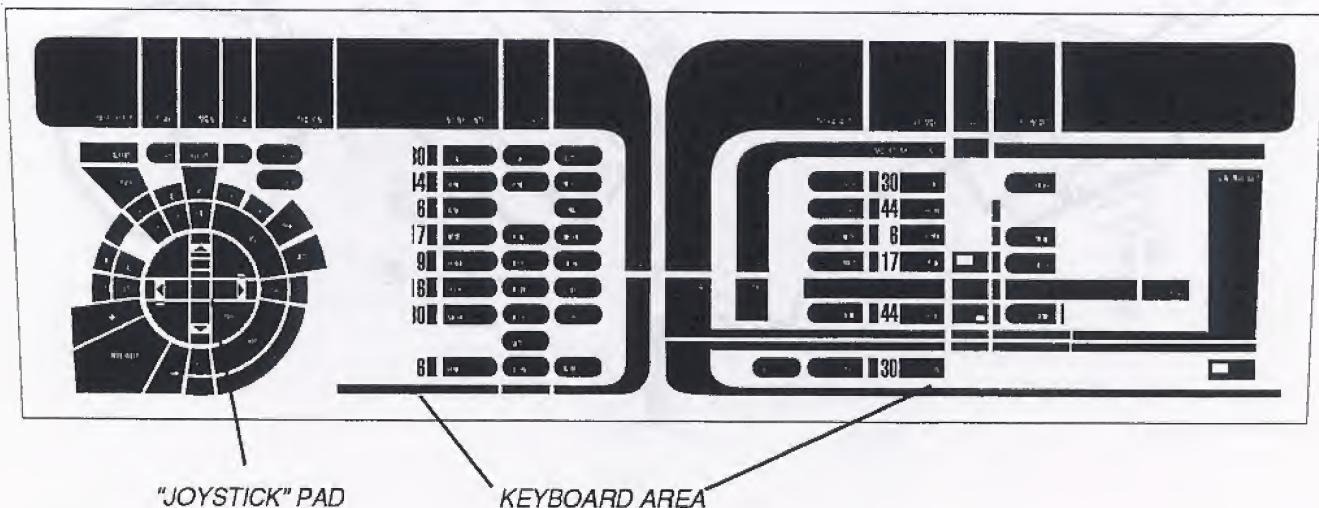
Most *Voyager* control panels have a keyboard area which is usually closest to the operator. These are the buttons which control most routine functions, and about three-fourths of your control panel "business" should be in this area. This will represent most routine things that you want your panel to do. Less routine tasks may require you to touch some controls outside of the keyboard area.

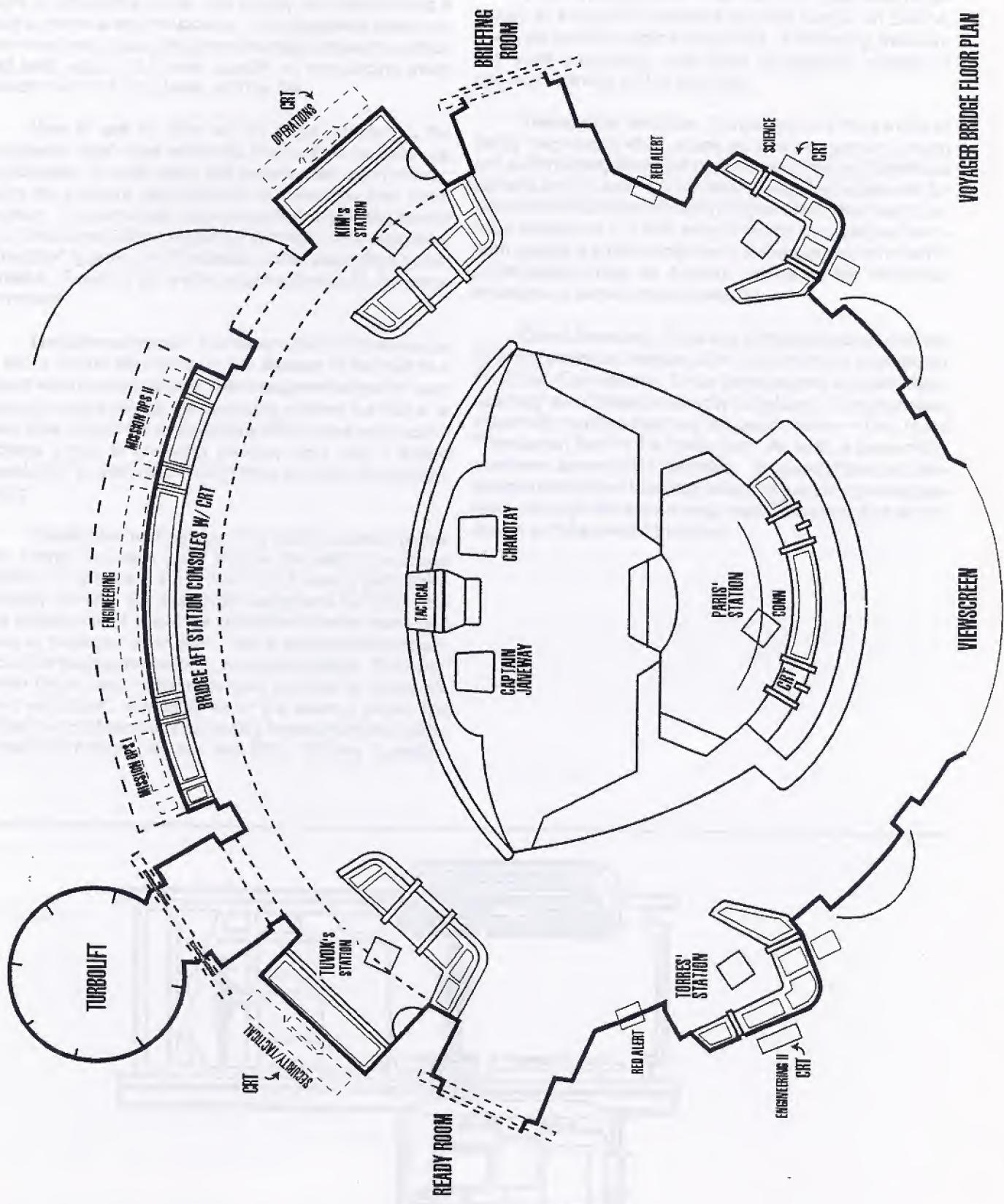
One specialized item you may wish to use on occasion is the *joystick pad* provided on some panels for manual steering, targeting, and such. Most aiming and steering will be done automatically, but you may want to use the joystick pads for occasional things the computer isn't programmed to handle.

Our computers can anticipate most of your needs and are constantly reprogramming themselves to handle them with a minimum effort on your part. Most routine operations will require only a few keystrokes, or perhaps only a voice command. You do not have to be a concert pianist to fly the ship. The only time you will need to demonstrate fast and furious keyboard work is when you're doing something very unusual, or when some kind of system failure requires you to take manual control.

Always remember that your characters are skilled professionals with many years of starship experience. Even when things get rough, you should have no difficulty in operating your controls with ease — and maybe even a bit of flair.

Typical control panel





VOYAGER BRIDGE FLOOR PLAN

TRANSPORTER

In brief: The transporter is a remarkable device capable of converting matter into energy and reconverting it back to matter at another location. The transporter allows our crew members to go quickly from the ship to a planet's surface and back again. It is also capable of reproducing many objects such as foods, tools, and the like.

How to use it: Prior to use of the transporter, the transporter chief must enter the beam down or beam up coordinates. In most cases, this is performed automatically, using the person's communicator to determine their exact position. To beam down, the transportees (up to six persons at a time) stand in the transporter chamber. The command, "Energize" is given, and it takes about five seconds to dematerialize. Beaming up is also accomplished with the same command.

Limitations in brief: The transporter is limited in range to about 40,000 kilometers, or the distance of the ship to a planet while in standard orbit. The transporter cannot be used when the ship's shields are operating or when the ship is at warp drive (unless the destination is at the same warp factor). Objects stored in computer memory have only a limited "resolution" so that one CANNOT store and reproduce a living being.

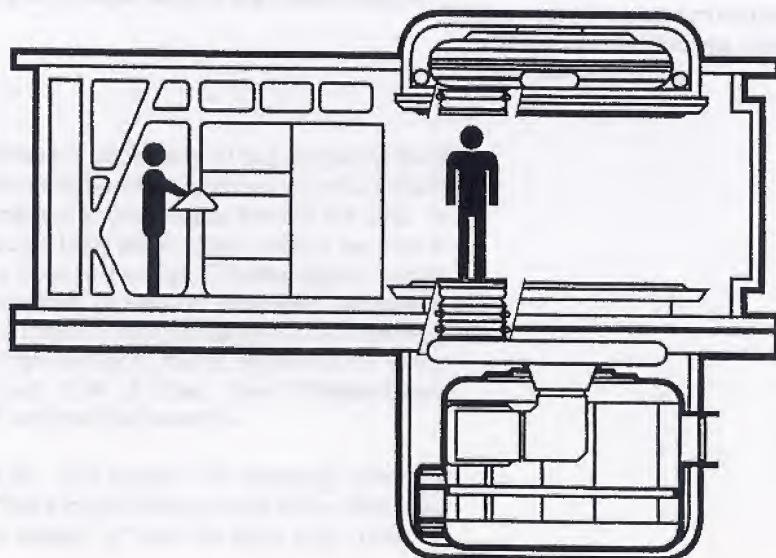
Replication technology: The ability to convert matter into energy and back again implies the ability to recreate objects. This is done in the ship's food service units which instantly recreate any dish in the computer's memory. The key limitation here is that the computer memory stores patterns at "molecular resolution". This is adequate for food and tools, but inadequate for living, conscious beings. The transporter (when used to beam people) operates at "quantum-level resolution", recreating all of the electron states and subatomic configurations necessary to accurately reproduce a person's thought patterns and DNA. Storing "quantum-

level" patterns would require billions of times more memory than the *Voyager* computers can hold.

Other transporters: There are two personnel transporters in *Voyager*'s command (saucer) section on Deck 4. There are also two cargo transporters. Additionally, there are four small emergency evacuation transporters capable of one-way beaming off the ship only.

Transporter biofilter: The transporters have a built-in safety mechanism which scans an incoming person's beam and automatically filters out many kinds of known hazardous bacteria and viruses. It is not effective against organisms for which the biofilter has not been programmed. This may prove to be dangerous in a new area of space; the possible short-term remedy is for the computer to extrapolate which unfamiliar organisms may be harmful, based on the molecular structures of known microorganisms.

Direct beaming: Most use of the transporter involves beaming people or objects either to or from the Transporter Chamber. On occasion, it may be necessary to order "direct beaming" as in "beam her directly to Sickbay". This procedure essentially involves beaming the person twice — first, to the Transporter, then to the destination. As such, it presumably consumes almost twice the power. Because of this, our crew tends to avoid direct beaming unless time or safety considerations outweigh the extra energy cost. This procedure is also known as "site-to-site" transport.



transporter

ENVIRONMENTAL SYSTEMS: ATMOSPHERIC SYSTEM

In brief: *Voyager's* environmental support system is extremely reliable and rarely subject to significant problems. This is important to the believability of our ship, but it means that story situations in which the life support systems can credibly fail are relatively infrequent.

More: *Voyager* maintains breathable air for its crew through the use of two identical atmospheric processing and distribution networks. Each network serves as a backup to the other. A third, reserve system, can provide breathable atmosphere for 24 hours in the unlikely event of failure by both primary systems. Finally, emergency supply modules can provide up to 30 minutes of air, sufficient to allow the crew to evacuate to designated emergency environmental shelters. The Officer's Mess (Wardroom) and the Bridge are among these shelter areas. Plants and other tailored microorganisms may augment the atmospheric processing systems during periods of power conservation.

ENVIRONMENTAL SYSTEMS: ARTIFICIAL GRAVITY

Synthetic gravity: *Voyager* uses a network of force field generators to create an artificial gravity field virtually identical to Earth's. These generators employ a series of superconducting graviton field matrices located under each deck. Because of the superconducting components, these hockey puck-sized gizmos can remain in operation for several hours, even when power is cut off. Again, this means that situations under which the gravity will fail are rare.

Inertial damping field: A second set of forcefield generators is used to create a field which absorbs the inertial stress created when the ship accelerates to high impulse speed or warp drive. (Otherwise, the high gee-forces would instantly crush our crew beyond recognition.) The inertial damping field generators also create a "structural integrity field" which helps reinforce the structure of the ship. Thanks to an incredibly ingenious energy-conservation system, the IDF and SIF also serve to absorb and recycle the excessive inertia generated by each other and by the tractor beams.

TRACTOR BEAMS

In brief: Starfleet's equivalent of the grappling hook and towing line. A focused beam of polarized gravitons which acts as a linear forcefield to pull objects toward the ship. In general, you can pull a fairly large object (about the size of *Voyager*) if it's fairly close to the ship. Smaller objects can be pulled, even at distances of several thousand kilometers. Objects the size of a moon or even an asteroid are extremely difficult (and often impossible) to move, even with full warp-equivalent power and a lot of time. See "Tractor Beam Operation" under Technical Memoranda.

How to use it: The captain will normally order the Tactical Officer to "Put a tractor beam on the object and bring it within transporter range," or "take the alien ship in tow."

SYSTEM DIAGNOSTICS

In brief: When trouble is suspected in a shipboard system, our crew will often perform a number of standardized procedures called "system diagnostics." Most key systems have several pre-programmed diagnostic programs, ranging from a "Level One Diagnostic," which can take several hours to perform, to a "Level Five Diagnostic" which usually takes just a few seconds.

How to use it: A senior officer (like the chief engineer) will usually order something like: "Perform a Level One diagnostic on the transporter system."

SICKBAY OPERATIONS

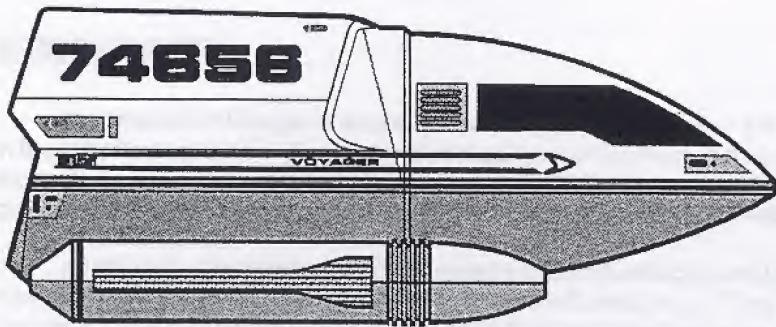
In Brief: The USS *Voyager* maintains a fully-equipped medical facility, complete with surgical center, recovery units, and specialized treatment rooms. Trained medical personnel can care for sick or injured crew with a variety of advanced diagnostic and healing devices, including the medical tricorder, hypospray, and neural headpads.

The loss of the ship's doctor requires the use of the Emergency Medical Hologram, whose movement capabilities are subject to some of the same limitations as other holodeck animated figures (see HOLODECK). The exact nature of Doc Zimmerman's abilities to move about and manipulate objects will be developed during the series.

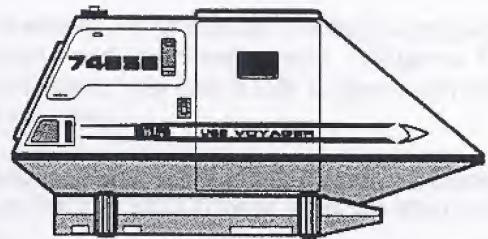
One possible limitation of the reduced power mode of the ship is the rationing of power to medical replicators, which produce custom pharmaceuticals. It may be possible to augment our stored and replicated medicines with exotic chemical or plant materials found during the journey home.

ALIEN TECHNOLOGY

We may find ourselves in need of certain bits of alien equipment to keep the ship operating on the trip home. This may create a situation somewhat opposite that of DS9, whose Cardassian technology has been supplanted by numerous Starfleet additions.



Personnel Shuttlecraft

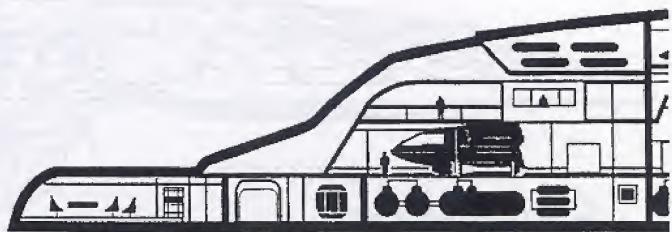


Shuttlepod

SHUTTLECRAFT AND SHUTTLEBAYS

In brief: *Voyager* carries a number of small auxiliary spacecraft for short-range use when a transporter is inappropriate. Most of our shuttlecraft are named after famous explorers and scientists.

More: *Voyager* normally carries two standard shuttlecraft, four of the smaller shuttlepods, and four EVA workpods. Normal operating rules require the ship to maintain one shuttlecraft and one shuttlepod at operational (nearly ready to launch) status at all times. Standard shuttlecraft are used for transport of up to 12 people on short trips within a solar system. Maximum speed of these craft is Warp 3.



Shuttlecraft landing bay

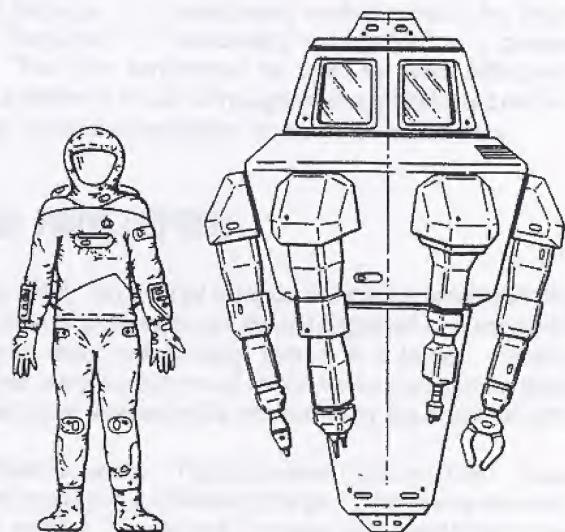
Shuttlepod: A small two-person craft, about the size of a Hyundai. The shuttlepod is used for very short-range transport and for extravehicular activity (like inspecting the ship's exterior). Shuttlepods are incapable of warp speed.

Shuttle bay: *Voyager* has one SHUTTLE BAY located at the rear of the Engineering Hull. This facility is located on Decks 9 and 10.

EVA Workpod: A small, elongated hexagonal capsule sized to fit one crewmember. The workpod is equipped with manipulator arms containing various tools for repair and exploration tasks outside the ship, and operates on low-power thrusters only. *Voyager* normally carries four workpods.

AeroWing and Dock: The bottom of the Primary Hull or saucer holds a single aerodynamic shuttle capable of atmospheric travel as well as interplanetary flight at speeds up to Warp 3. The AeroWing can carry various combinations of crew and cargo; the usual flight complement numbers four crewmembers.

Shuttlecraft names: We have not yet established the names for the two main *Voyager* shuttles or AeroWing; these will be forthcoming as scripts call for them.

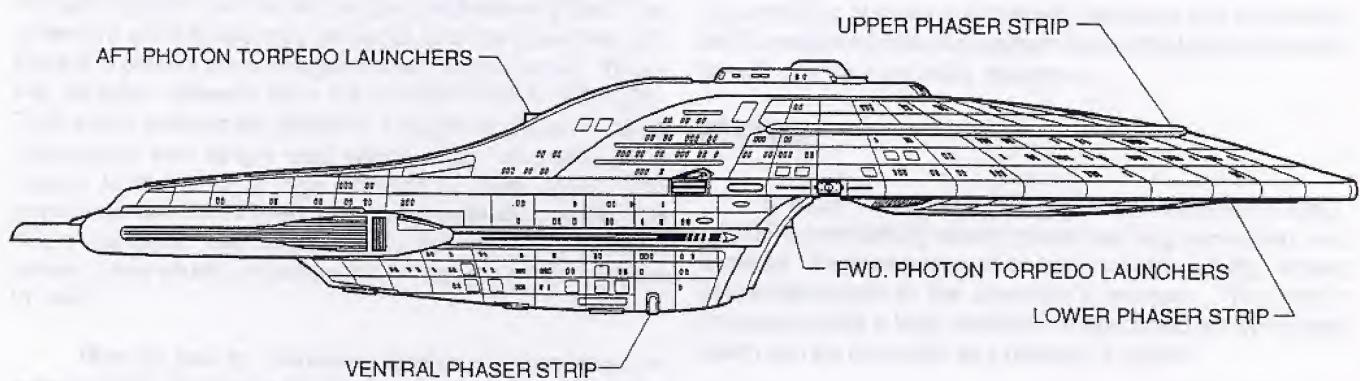


EVA workpod

WEAPONS AND DEFENSE

The mission of *Voyager* is exploration, science, and diplomacy. It is not a warship, nor is Starfleet a military organization in the 20th Century sense. Nevertheless, the galaxy is a big place, full of unknown -- and occasionally hostile -- life forms. For those times when *Voyager* must protect itself during the journey back to the Federation, the ship is fully equipped with both defensive and offensive weaponry. When provoked, *Voyager* is a formidable adversary.

Additionally, Janeway's staff is fully trained in cultural sociology, strategy and crisis analysis, and they have at their disposal a powerful array of information-gathering sensors and computers. They know that their skills in these areas are often more important in the successful resolution of a crisis than are advanced weaponry.



Phaser banks and Photon Torpedo Launchers

WEAPONS - SHIP'S PHASERS

In brief: A particle/beam projector which is the ship's primary offensive weapon. *Voyager* has a number of massive phaser banks that wrap around both of the ship's main sections. At maximum power, the main phaser banks can totally disrupt the surface of a planet. Phaser beams travel at the speed of light, and thus are relatively ineffective at warp speed. Phaser is short for "PHAsed Energy Rectification". Maximum effective phaser range is about 300,000 kilometers.

How to use it: Typical orders given during tactical maneuvers might include: "Energize phaser banks to full power," "Target the Romulan ship," "Fire phasers," and "Power down phaser banks."

More: Phaser power is usually expressed in percentages or fractions of rated power. A "two percent" phaser blast will barely nudge a target, but a "full power" shot will cause

serious damage. It is occasionally useful to adjust the "base emitter frequency" or "secondary modulation" of a phaser beam. This can sometimes be used to more effectively disrupt a deflector shield, although most sophisticated deflectors use "random modulation" to prevent such tactics.

WEAPONS - PHOTON TORPEDOES

In brief: An energy weapon in which a small quantity of matter and antimatter are bound together in a magnetic bottle and launched at warp speed at a target. Photon torpedoes are the weapons of choice when the ship is at warp drive, because their speed is not limited by the speed of light.

How to use it: Typical orders might include: "Load forward torpedo tube, standard charge," "Program a standard torpedo spread," "Target the Romulan ship," and "Fire torpedoes."

Torpedo Launchers: There are four torpedo launchers on *Voyager*, two at the lower front and two at the top rear of the Engineering hull. Photon torpedoes are "smart" weapons and are capable of tracking a moving target. Torpedoes are usually launched in clusters, each independently targeted. The explosive power of a photon torpedo can be varied by the amount of antimatter loaded into the unit.

Torpedo Power: Explosive yield can be varied from level 1 (just a fireworks display), to level 5 (a standard one kilogram antimatter charge), to a maximum of level 10 (when you want to violate strategic arms limitation treaties.)

Torpedo Limitations: *Voyager* does not carry an unlimited supply of torpedo casings; hence the need to occasionally fabricate new ones from raw planetary materials. *Voyager* will also employ new Microtorpedoes, roughly the size of a computer chip, for a variety of missions.

DEFENSIVE SHIELDS

In brief: A series of energy forcefields which protect *Voyager* against both natural dangers and enemy attack. The defensive shields are very powerful and are more than adequate to protect the ship against most hostile forces. These are distinctly different from the NAVIGATIONAL DEFLECTOR which sweeps far ahead of *Voyager* and pushes aside meteoroids and space dust which might otherwise be a hazard to the ship at high impulse or warp speed. The transporter cannot be used when the shields are in place. The ship's computer can automatically activate the shields in certain crisis situations before our human crew has a chance to react.

How to use it: Defensive shields will sometimes be automatically activated by the ship's computer in certain hazardous situations. In such cases, the tactical officer might report that "Shields just came on." In other cases, specific dialog might include: "Raise shields," "Full power to forward shields," "Shields failing," or "Lower shields."

Defensive shield power: Usually expressed in terms of percentage of shielding remaining, as in "shields down to thirty-seven percent... we cannot survive another attack."

The navigational deflector, the big dish-like apparatus at the front of the Engineering Hull, can also be utilized as a weapon by channeling warp power directly to a series of power conditioners and emitters. This power can be focussed to produce a variety of high-energy effects.

TACTICAL ANALYSIS

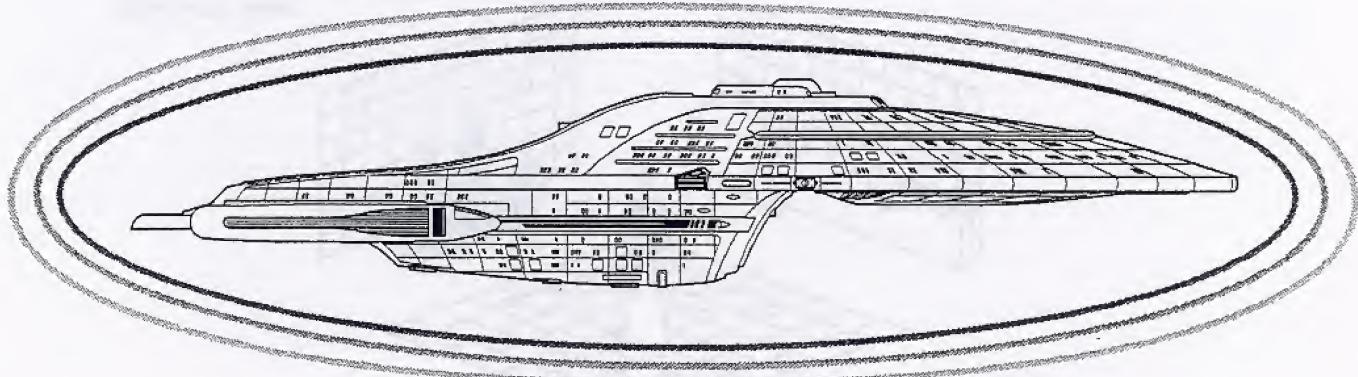
One of the more formidable weapons in *Voyager*'s arsenal is its extensive tactical analysis ability. These capabilities and skills are often more important in the successful resolution of a crisis than are advanced weaponry and shields. The ship's captain and staff are fully trained in cultural sociology, crisis analysis, and strategy. They are able to anticipate and deal with most potential conflicts, long before they reach the need for force.

Sensors and computers play an crucial part in the ship's defensive and offensive capabilities. The intelligence-gathering capability of these sophisticated systems are a powerful tool in evaluating potential adversaries and helping our people to estimate their probable responses.

HOLODECKS

In brief: The HOLOGRAPHIC ENVIRONMENT SIMULATOR is wonderfully useful for crew training, recreation, and exercise. It can recreate, with virtually 100% fidelity, almost any environment in the computer's memory. The ship's computer holds a large selection of simulated environments which can be recreated at a moment's notice.

How to use it: Holodecks are usually activated by small control panel just outside the holodeck doors. The computer displays a menu of available simulations, and the user will tell the computer which one he/she wants, as in "Load



Defensive Shield Energy

Altair IV program," to which the computer would respond, "Program loaded, enter when ready." When in the holodeck, a simulation can be halted by saying, "Freeze program." If desired, one can also ask the computer to "save program" so that you can go back at a later time.

How it works: The Holodeck uses two main subsystems, the holographic imagery subsystem and the matter conversion subsystem. The holographic imagery system creates images of incredibly realistic background environments. The computer-driven holographic projectors also control a series of shaped-field forcebeam projectors which are capable of giving physical substance to these images. The second major subsystem is the matter conversion system. Using transporter-based technology, this system creates physical "props" and "set dressing" from raw material. Under normal conditions, a participant in a holodeck simulation should be unable to tell the difference between the two types of props.

The Holodeck and animated characters: The holodeck often generates astoundingly lifelike simulations of humans and other life-forms. Such animated characters are composed of solid matter created by transporter-based replicators and manipulated by highly articulated computerized tractor beams. This results in incredibly realistic "puppets" which look and behave almost exactly like living beings (note that transporter-based matter replication is incapable of duplicating an actual living being). Doc Zimmerman is a prime example of a holodeck character; the difference in the *Voyager* scenario is that the Doc can appear in places other than the standard holodeck, so long there are holo-projectors built into the room. Because holo-projectors are visual and force-field devices, Doc can hold real objects and perform surgical procedures.

The Holodeck and the reality of objects: Objects created on the holodeck which are pure holographic images cannot be removed from the holodeck, even if they have apparent physical reality because of focused forcebeam

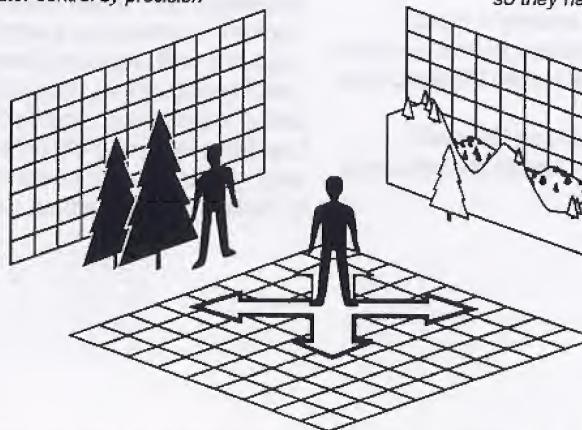
imagery. Objects created by transporter matter conversion do indeed have physical reality and can indeed be removed from the holodeck, even though they may no longer be under computer control.

Location: Holodecks 1 and 2 have yet to be physically located on *Voyager*, but could logically be placed on Deck 6.

Personal holodecks: In addition to the large holodecks normally seen on the show, *Voyager* may have four smaller "PERSONAL HOLODECKS". These rooms are the holodeck equivalent of a treadmill. In one of these rooms, one can jog for miles in Yosemite National Park, climb Mount Selenya on Vulcan, or even go Scuba diving. Use of these rooms may have to be severely rationed in the event of a long power-down period.

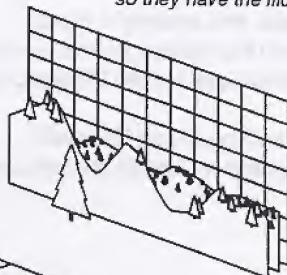
(Note: In the *TNG* episode "Elementary, Dear Data", the character of Moriarty was "alive" in the sense that the holodeck control computer created a program for the character that was so sophisticated that the computer program—not the "puppet"—became "alive".)

Matter conversion subsystem creates physical props using replicators. Replicated props are generally created when an object is likely to be touched by the participant. Some props are animated under computer control by precision-guided tractor beams.



Substrate force field creates "treadmill" effect, permitting participant to remain stationary while the simulated environment "scrolls" by, within the limits of the simulation program.

Holographic imagery subsystem creates three-dimensional images of simulated environments. Shaped forcebeams give physical substance to foreground objects so they have the illusion of being solid.



COMPUTER SYSTEM

In brief: One of *Voyager*'s most important components is its massive library computer system which is used in virtually every element of ship and mission operations. Nearly every control panel on the ship is, in effect, a computer terminal and can respond to voice commands as well as keypad input. The *Voyager* computer — like all its systems — are designed for the ease and convenience of the crew. Unlike its clumsy 20th century ancestors, the ship's computer is easy to use.

How to use it: Much computer use is verbal, that is, you just talk to it, and it talks back. For example: "Computer, analyze sensor readings on the planet's atmosphere. Could it support humanoid life?" The computer might respond: "Negative, insufficient oxygen content." You can also ask the computer to "show me the sensor logs from the starship *Endeavour*," which would cause the computer to display the desired visual information on a control panel screen.

Isoninear optical chips: The information storage medium of *Voyager*'s computer system is the isoninear chip. This small rectangle of isochromatic linear memory crystal incorporates a large amount of information storage and a considerable amount of computer processing power. These chips are throughout the ship's optical processing network, often found mounted in "chip panel" racks. Isoninear chips are also used for portable information transport, much as we use books or videocassettes today.

Neural gel-packs: In addition to the banks of standard isoninear chips, Starfleet has incorporated a new leap in computer technology into *Voyager* in the form of synthetic brain neurons suspended in a nutrient gel medium. Based on the organization of neurons and synapses in the humanoid brain, these gel networks make informed decisions at a faster rate than the chips alone, in that they do not have to calculate *all* possible actions (as in a fast chess program), but will rather go with a best "guess."

Operating system: The main library computers of *Voyager* employ optical (rather than electronic) processing. There is one large computer core near the center of the Primary (saucer) Hull, and one in the Engineering Hull, each incorporating a series of miniature subspace field generators, allowing information to be processed faster than lightspeed (this is a key limitation to 20th Century computers). Information is carried by a complex network of optical fiber conduits. The proper name of the main computer is the Library Computer Access and Retrieval System, sometimes called "LCARS". The entire ship is linked to the computer cores and to various subprocessors by means of the Optical Data Network, which can be described as the nervous system of *Voyager*.

SENSORS

In brief: "Sensors" are an impressive collection of sophisticated scientific instruments which provide much useful information to our crew. In order to avoid cluttering dialog with a battery of confusing technical names, we lump these instruments under the generic term "sensors". Like the *Enterprise*, *Voyager* is one of the most advanced scientific research craft in existence and has the most advanced and sophisticated sensors ever built.

More: *Voyager* has a number of sensor arrays located around the hull of the ship. These include the lateral, forward, aft, upper, and lower arrays. Additionally, there is the long-range sensor array at the front of the engineering hull which continually sweeps far ahead of the ship to detect possible upcoming hazards.

Tricorders: These nifty handheld devices contain a miniature sensor cluster, giving our crew the ability to detect a wide variety of phenomena. Tricorders are tremendously useful for a wide range of scientific, engineering, and medical applications.

PROBES

In brief: *Voyager* carries a variety of small unmanned instrumented space probes which can be used to return valuable sensor information to the ship. Probes are generally used to find out things about areas which are out of sensor range (inside of a thick dust cloud, for example) or into which one does not wish to take *Voyager*. Probes are fired from the Photon Torpedo launchers. A variety of probe types are available.

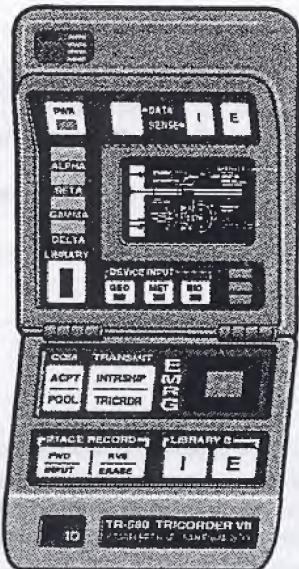
Class I probes are short-range devices which carry the widest range of instrumentation. Class II probes are similar to Class I, but with a somewhat greater range.

Class III probes are designed for entry into a planet's atmosphere and can be equipped for softlanding on many planetary surface types. Class IV probes are similar to Class III, but modified for close-range study of stars and their atmospheres.

Class V probes are designed for tactical reconnaissance, Class VI probes are used as communications relays, and Class VII probes are used for remote cultural studies.

Class VIII and IX probes are capable of extended warp travel and are based on a photon torpedo spaceframe.

TRICORDERS



In brief: A handheld scientific instrument, the Swiss army pocketknife of 24th Century science. A combination sensor, computer and recorder, the tricorder is used to analyze and detect virtually anything needed on our Away missions and on board ship. Special purpose tricorders are also available, like the medical tricorder used by Doc Zimmerman. Standard tricorders are incapable of sensing neutrinos or subspace phenomena, although special purpose tricorders or peripherals could provide this ability if needed.

How to use it: Simply point the tricorder at whatever it is you want to study. Information will (theoretically) appear on the tricorder's tiny built-in screen. The person using the tricorder would then report something like: "Tricorder readings indicate no other life forms within a fifty meter radius." The tricorder can be easily adjusted to detect many different things at the touch of a few buttons.

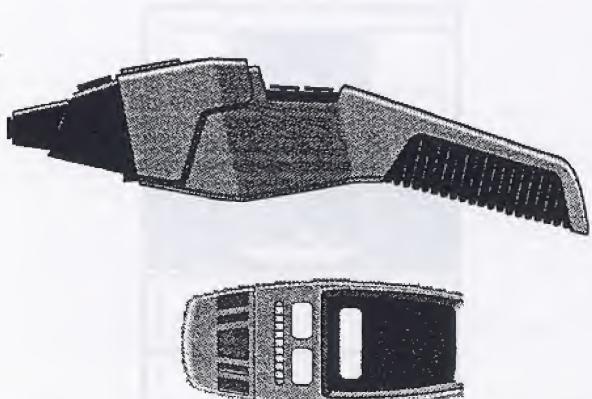
COMMUNICATORS



In brief: The Starfleet insignia on our uniforms also serves as a personal voice communications device. Communicators are activated by touch, as well as by voice. Maximum usable distance is slightly more than transporter range, about 60,000 kilometers. Companels are located throughout the ship, and these are sometimes used instead of one's personal communicator. Communicators are equipped with a "dermal sensor" which can automatically verify the identity of the person by his or her touch. Communicators also serve as a homing beacon with which the transporter can determine the exact coordinates of a person to be beamed back to the ship.

How to use it: Just tap the badge and verbally indicate who you want to talk to, as in "Janeway to Kim," or "Paris to Engineering." The communicator will automatically make the connection.

PERSONAL PHASERS



In brief: Personal phasers are the normal sidearms used by the Voyager crew. Phasers have a variety of settings ranging from "stun" (which renders a person briefly unconscious) to "cut" (which acts as a cutting torch) to "disrupt" (which actually vaporizes the target.)

How to use it: Just point and shoot. Phasers are normally set to "stun," but have controls which permit adjustment to other settings and power levels.

Phaser types: The smallest, Type I, is about the size of a keychain, carried when our people want to be inconspicuously armed. Although a potent weapon, the Type I phaser is only good for a few shots. The next size up is Type II, carried when trouble is suspected. Larger phasers include the Type III phaser compression rifle, which until now were only rarely carried aboard Starfleet vessels.

TURBOLIFTS

Turbo-elevators are capable of travelling both vertically and horizontally. Turbolifts connect to nearly every deck and section of *Voyager*. A network of Jefferies Tubes and ladder wells can also be used for travel between decks when the turbolifts are inoperative, or when power is rationed.

How to use it: Control of the turbolifts is vocal ("Deck 5, Sickbay.")

ESCAPE PODS

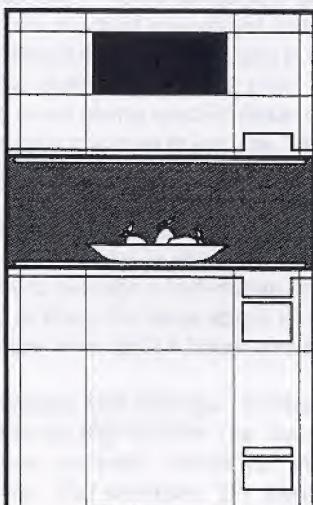
Thirty-six lifeboat pods are available for use in extreme emergency. These pods would be ejected from the ship and cluster together, awaiting rescue. We'll probably never see these in full use because of the enormous production cost that would be entailed, but in a crisis, we might hear an order for all personnel to report to escape pods. The escape pod ejection hatches are visible on the ship's exterior as rows of small, light colored square shapes.

FOOD SERVICE TECHNOLOGY

In brief: Most food service aboard *Voyager* was to be provided by handy transporter terminals, usually called FOOD REPLICATORS, which can instantly materialize virtually any dish in the computer's memory at a moment's notice. Power limitations make replicator usage much more limited than on the *Enterprise*. Kes will set up a hydroponic garden, and Neelix a kitchen, to augment the ship's foodstuffs.

How to use it: One can simply press a button on the replicator control panel to indicate your choice (the panel is presumably capable of displaying a menu), or one can verbally indicate what you want, as in Picard's famous "Tea. Earl Grey. Hot."

Food replicator terminal



More: As with all transporter-based replication technology, food service transporter terminals recreate matter at the "molecular resolution level", which means it is sufficient to duplicate nutritional properties and taste, but is inadequate to recreate a living being.

SUBSPACE RADIO

In brief: A faster-than-light means of communications, necessary because the size of the Federation and of the vast operating range of starships. (Without subspace radio, a starship could warp to a distant planet and back in much less time than it would take to send a conventional radio message).

The speed of subspace radio: Subspace radio propagates at a maximum speed of about Warp 9.9999 (about 100 times faster than maximum warp, 9.6). The key limitation is that this speed falls off dramatically over time as the warp fields decay. This is not a problem within the Federation, as there is a complex network of relays and boosters which keep subspace messages going at near-maximum speed (which allows a message to cross the entire Federation — 10,000 light years — about two weeks). Outside of the Federation, this network does not exist and messages travel much more slowly. This is one of the key problems facing *Voyager*'s crew — even if the superfast subspace message remained intact over galactic distances, it would still take over a year to get back to Starfleet.

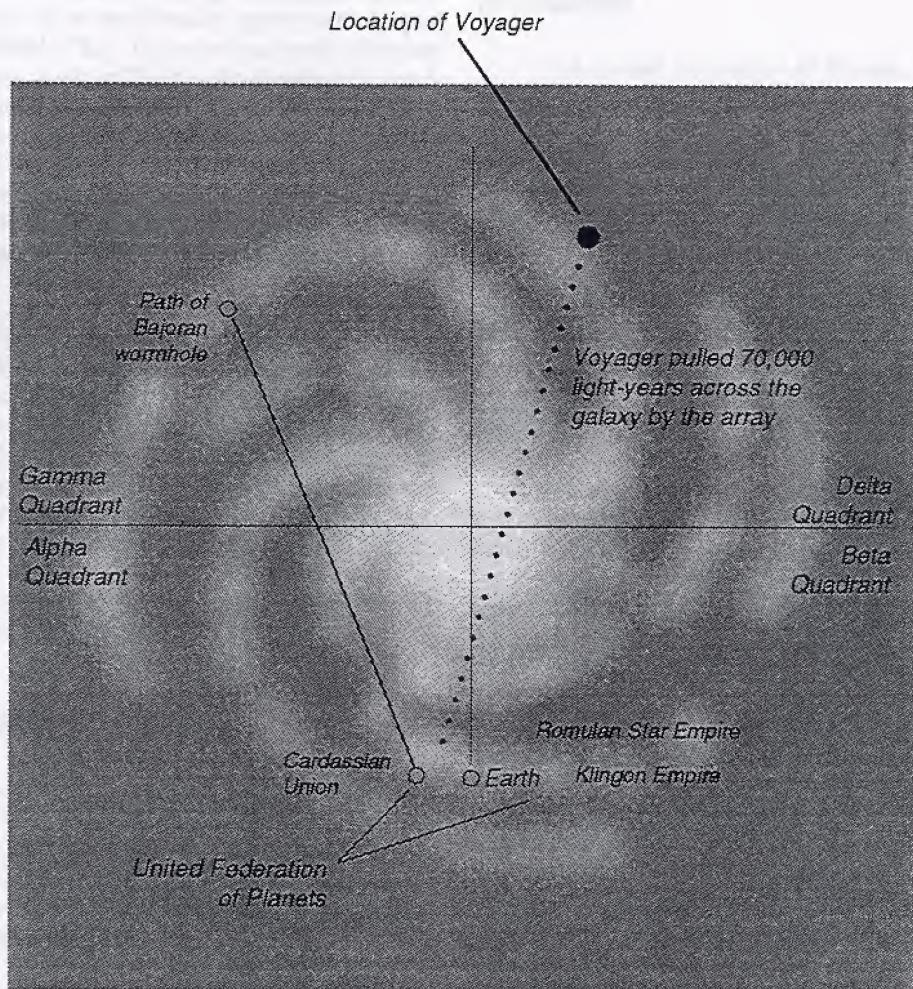
SPACEFLIGHT AND THE GALAXY

Standard orbit: When *Voyager* orbits a planet, it generally assumes what is called STANDARD ORBIT. For a Class M (Earth-like) planet, this is often a synchronous orbit at about 35,000 kilometers altitude.

Warp drive: The distances between the stars are so vast that the ship is normally under warp drive except when in orbit or when it is within a solar system. By comparison, impulse speed represents a virtual standstill.

Courses and directions: Most times when the Captain specifies a course for the ship or a direction in space, it should be in the form: "Unidentified spacecraft at bearing 104, mark 12", where both numbers are measurements in degrees (which means that both numbers should be less than 360). Other forms used when setting courses include specifying Sectors, or just the name of the destination planet.

For the truly curious: The term "bearing" (as in Bearing 270, mark 47) refers to two angles measured relative to *Voyager*. (Bearing 000, Mark 0 is straight ahead.) The term "heading" (as in Heading 270, mark 47) refers to angles measured relative to the galaxy itself. Imagine you're driving a car and think of "bearing 090" as turning right (relative to the car), but "heading 090" would be turn west (relative to the Earth). Put another way, you would generally specify a *heading* when you're setting out on a new trip, but then use a *bearing* to specify a course correction relative to the original heading. If this is confusing, don't worry, you're usually safe if you just use "bearings".



The Milky Way Galaxy

A note on distances in spaceflight maneuvers: Giving precise distances and speeds to other spacecraft in dialog usually sounds good, but can sometimes create problems for our visual effects staff. It may be technically correct to have a character say, "Alien spacecraft closing to 5,000 kilometers." In terms of actual spaceflight, this is pretty close, but this makes it difficult if we need a scene in which *Voyager* is seen in the same shot with this other ship. In such cases, it is often better to avoid giving specific distances, speeds, or positions. An example might be to just say, "Alien spacecraft now approaching, dead slow."

Sectors: The primary unit of measure in known space is the SECTOR. Each sector is about 20 light-years across and typically contains perhaps a half-dozen solar systems. A starship travelling at Warp Six takes about 19 days to cross a sector. At maximum warp (9.6) it takes about 4 days.

Sector numbers and names: Sectors are properly known by a three-to-six digit number (i.e. Sector 18834), but many sectors have common names for their major star systems or planets. For example, the Earth is located in

Sector 001, also known as the Sol Sector, and Starbase 515 was located in the Scylla Sector.

Quadrants: The galaxy is divided into four QUADRANTS. Each quadrant is *incredibly* huge (about eight billion cubic light-years, hundreds of thousands of sectors). The four quadrants are labeled with Greek letters, Alpha, Beta, Delta, and Gamma. The Federation is located at the boundary between Alpha and Beta quadrants. Even within these two "home" quadrants are vast volumes of unexplored space. It was once very unusual for a Federation starship to even reach to the other side of the galaxy into the Delta or Gamma quadrants (we have no doubt that Starfleet will eventually get around to exploring those areas, but there is still so much to explore nearer home). The Idran Wormhole on *DS9* has now gotten us to the Gamma Quadrant, and *Voyager* is, of necessity, exploring the first few sectors of the Delta Quadrant. Quadrants are so big that we rarely refer to them in day-to-day operations, much as you would rarely talk about continents while driving interstate.

Galactic coordinates: When specifying travel destinations for *Voyager*, it is occasionally appropriate to give GALACTIC COORDINATES. These are generally given in a set of three numbers, such as "Set course for galactic coordinates 394345 by 885354 by 032234." (Note that the galaxy is such a huge place that these numbers are fairly imprecise, sort of like specifying a ZIP code but not the street address.) In most cases it will be easier and more understandable to simply specify the destination sector ("Set course for the Orion Sector") or even just the direction of flight ("Set course 312, mark 5").

Starbases: Starfleet Command maintains a network of a little over five hundred support and operations facilities throughout Federation space, some on the surfaces of planets, while others are space stations. A starbase is generally the next-higher authority in the Starfleet chain-of-command over a starship captain. Starships often operate past the frontier of Federation space, and it is not uncommon for them to be weeks out of touch with any starbase, even by subspace radio.

Note: For estimated travel times at various warp factors, see the Warp Speed chart on p. 13.

STAR AND PLANET NAMES

The question of stellar nomenclature has always been a part of *Star Trek*, as far back as the original series. While it wasn't always clear as to which star we were heading for, with names like Ceti Alpha (a simple reversal of the accepted standard in the astronomical community), we knew we were heading for some specific place.

Star Trek: The Next Generation did make an effort to conform to the established standard, which is as follows:

In any constellation visible from Earth, the brightest star gets the first Greek letter (alpha), followed by the name of the constellation. Example: The brightest star in the constellation Cygnus (the Swan) is alpha Cygni. The next is beta Cygni. And so on. When you've run out of Greek letters, you continue with numbers. Planets get Roman numerals; moons get small letters: alpha Cygni IV is the third moon of the fourth planet.

Anyhow, that's the way that works. Now, finding a habitable planet around a promising star is another matter altogether; we usually manage to find them when we need them.

Many stars have ancient names like Betelgeuse or Archenar. Made-up names like that are fine. The same scheme can apply here: Betelgeuse VI is valid. Altair IV is valid (though, as we all know, Altair IV blew up in 1956 in *Forbidden Planet*).

Voyager Update: Our Starfleet people don't know the formal names of anything in the Delta Quadrant. Neelix and Kes will know the native names of some stars and planets, but our people will undoubtedly end up naming many stars, in order to update the galactic database.

THE FEDERATION

The United Federation of Planets comprises perhaps 150 different cultures and colony planets, representing a wide diversity of life forms. It has been in existence for about 200 years and is the primary political organization within this small (perhaps 5%) part of the galaxy, but outside of its domain exist other organizations, such as the Romulan Star Empire, Ferengi Alliance, Cardassian Union, and the Borg Collective. Even within the Federation are large pockets of unexplored space in which there may well be planets and alien races to be discovered.

STARFLEET

The Federation Starfleet is an extraordinary organization dedicated to exploration, diplomacy, research, and defense. Although its mission includes military elements vital to the Federation's survival, Starfleet does not primarily consider itself a military organization in the 20th Century sense of the term. Think of a cross between the US Coast Guard, NASA, and Jacques Cousteau's *Calypso*.

In the wake of the devastating battle with the Borg at Wolf 359 (seen in *The Next Generation* episode "Best of Both Worlds Part II"), Starfleet embarked upon a major effort to rebuild the fleet. A significant number of new ships were rushed into service. The majority of these starships are relatively small vessels compared to the previously-seen *Galaxy* class *Enterprise*. It is important that despite its smaller size, the new *Voyager* be seen as the latest in technological development.

Ship Nomenclature: "Starship" is the generic term used by Starfleet for most of its interstellar spacecraft. We assume that there are a number of different types of starships designed for a number of different missions.

Class Nomenclature: Starfleet observes the old Naval tradition of naming each class of starships after the first ship built of its type. For example, *Voyager* is a *Intrepid* class starship, presumably named after the USS *Intrepid*, which would have been the first starship of that type built. The USS *Stargazer*, (Picard's former ship) was a *Constellation* class starship, while the original *Enterprise* (commanded by Captain Kirk), was a *Constitution* class vessel. Other starship classes include the *Nebula* class (one of the newest ship types, this was first seen as the USS *Phoenix* in "The Wounded"), the *Ambassador* class (first seen as the old *Enterprise*-C in "Yesterday's Enterprise."), the *Excelsior* class (first seen as the *Excelsior* in *Star Trek III*), the *Oberth* class (first seen as the USS *Grissom*), and the *Miranda* class (first seen as the USS *Reliant*.)

Starfleet Registry Numbers: Each Starship is identified by a Starfleet Registry Number, such as *Voyager*'s NCC-74656. Most current Starfleet vessels have five-digit registry numbers, such as the USS *Yamato*, which was NCC-71807, or the USS *Hood*, NCC-42296. The latest Starfleet ships now have registry numbers in the 74000 range. Most Starfleet

operational vessels have the characteristic "NCC" prefix, although some experimental ships have an "NX" designation. Additionally, we assume that various non-Starfleet vessels under Federation jurisdiction will have other prefixes (such as NAR-18834). Note: the *Enterprise* was a special case in that Starfleet choose to honor the original *Enterprise* by continuing to keep its number in service, simply adding a new letter suffix to each new ship bearing the name. The *Enterprise* is probably the only Starfleet vessel with a letter suffix in its registry number.

PREVIOUS ALIEN SPACECRAFT

For *The Next Generation*, we established a number of standard starship types for some of the alien cultures that we encountered on a recurring basis. Naturally, we prefered to use existing ships for budgetary reasons, but we assumed that each space-faring culture had a good range of vehicle types. We will likely begin a new round of inventing styles for new alien races for *Voyager*, like the Kazon, though we include the following descriptions as interesting background information.

KLINGONS

Klingon ships are roughly comparable to those of the Federation Starfleet. Thanks to a previous alliance with the Romulans, most Klingon ships are equipped with a cloaking device which renders them nearly invisible to most sensors. Because of the tremendous power drain involved, weapons systems cannot be used while the cloaking device is engaged.

Klingon Bird-of-Prey: We have most frequently seen the Klingon Bird-of-Prey (first seen in the feature film *Star Trek III*). This is a small vessel with a crew of about twelve. Propulsion is matter/antimatter warp drive, main weapons are called disruptors.

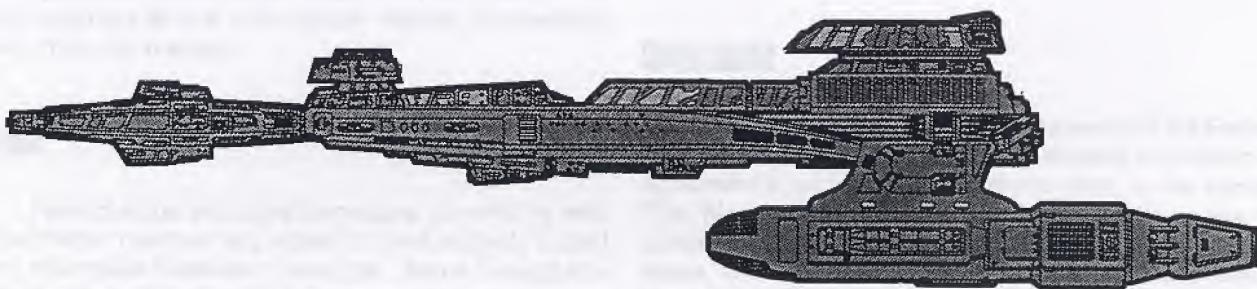
Klingon K't'inga class Battle Cruiser: First seen in the feature film *Star Trek I*. This is about the size of the original *Enterprise*. Propulsion is matter/antimatter warp drive, armed with disruptors and torpedoes.

Klingon K'Vort class Battle Cruiser: This is a larger version of the Bird-of-Prey. Propulsion is matter/antimatter warp drive, armed with disruptors and torpedoes. Power and range approach that of a *Galaxy* class starship.

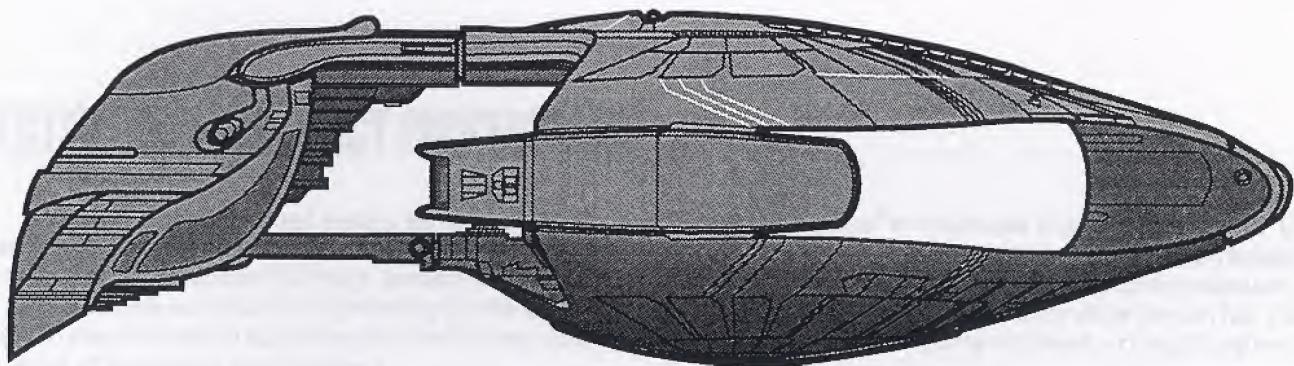
Klingon Vor'cha class Attack Cruiser: This newest, most powerful member of the Klingon fleet is about three-fourths the length of the *Enterprise*, but is equipped with a formidable array of disruptors and other weaponry. The forward part of this ship is normally a massive disruptor cannon which can be ejected in situations where speed is more important than firepower. In some attack cruisers, the forward disruptor cannon is replaced with other mission-specific weapons or hardware.

Notes on the cloaking device: Ships of the Federation Starfleet have only recently been equipped with cloaking devices. Although Starfleet has a reasonably good understanding of the technology involved, Federation policy prohibited the use of these devices in what is a primarily nonmilitary fleet. As Gene Roddenberry put it, "Our people are explorers — they don't sneak around."

The question of how accurately sensors can detect a cloaked ship will have a different answers at different times. The reason is that cloaking devices, like present-day stealth aircraft, represent a continually evolving technology whose designers always try to stay one step ahead of Federation sensor designers. Like any arms race, technical advances on both sides are frequent, but advantages are brief.



Klingon Vor'cha class attack cruiser



ROMULANS

In *TNG*, the Romulans only recently emerged from an extended period of isolationism, and thus very little was known about their technology. We do know that they have developed some formidable new ships in the interim, and that they are equipped with more sophisticated cloaking devices which render their ships nearly invisible to even our most advanced sensors. Because of the tremendous power drain involved, weapons systems cannot be used while the cloaking device is engaged. Romulan ships-of-the-line are generically called Warbirds.

A Neutral Zone still separates the Romulan Star Empire from the United Federation of Planets. This zone, about one light-year wide in most places, takes several hours to cross at Warp 8.

Romulan D'Deridex class Warbird: This is a huge vessel, which is probably more than a match for *Voyager* in terms of firepower. Maximum sustainable warp speed is about 9.1, slightly slower than that of *Voyager*. Power source is believed to be a system which harnesses the x-ray emissions from a captive quantum singularity. Armed with disruptor banks and torpedoes.

Romulan Scout Ship: Seen in "The Defector". A small, minimally armed, warp capable vehicle. Substantially slower than the Warbird.

FERENGI

Ferengi ships are called Marauders, powered by matter/antimatter reactors very similar to (and probably copied from) older-style Federation starships. Some Ferengi Marauders are equipped with a very powerful energy/wave weapon (seen in "The Last Outpost"), while others are armed with some kind of photon torpedoes.

THE BORG

The Borg is composed of a variety of life forms from around the galaxy which have been absorbed into the organization. Individual Borgs probably have no separate consciousness apart from the hive mentality, and the idea of the individual person is a totally alien concept to them. They are implanted at birth with various cybernetic devices which integrate them into the group and adapt them to their particular function in Borg society.

Very little is known about the huge cube-shaped (and recent asymmetrical) ships of the Borg. We do know that their technology is highly decentralized with each key system having numerous backups located throughout the ship. This gives their ships an ability to continue operating even after having absorbed a tremendous amount of damage. Starfleet believes the Borg use some kind of sophisticated power source which somehow taps the difference in energy-state potential between different layers of subspace. This gives them an almost unlimited power source which allows their ships to travel vast distances at very high warp factors. It also gives their ships the ability to quickly regenerate damaged parts during battle situations. The Borg home world is believed to be located on the other side of the galaxy, somewhere deep in the Delta Quadrant.

CARDASSIANS

The Cardassians have been adversaries of the Federation for many years, and have only recently concluded an agreement to end hostilities. Unfortunately, in the episode "The Wounded," our heroes discovered evidence that the Cardassians are less than sincere about their commitment to peace. The Cardassians continue to be a prominent race on *Deep Space Nine*.

Cardassian Galor class warship: A powerful starship, about the same length as *Voyager*. Main armament is described as a "compressor beam" fired from a "forward" or "aft weapons grid."

SECTION III: EMERGENCY PROCEDURES

Voyager is a finely honed system and is capable of dealing with most "routine" emergencies in an orderly manner. In many cases, automatic computer intervention will take care of problems so that the crew may not even be aware of them except by automatic notification on the bridge. Nevertheless, the journey of *Voyager* will occasionally require extraordinary measures. (A lot of these are so catastrophic [meaning they're *very* expensive to show] that we will probably never show them in full, but this stuff may be useful in suggesting the kind of preparations our crew may make in emergency situations, or things they may be afraid of in potential emergencies.)

AUTO-DESTRUCT

As a last-ditch effort to prevent *Voyager* from falling into hostile hands, the computer can be programmed to destroy the ship. This procedure is performed at any major computer terminal, and requires the verbal authorization of both the Captain and First Officer.

EMERGENCY EVACUATION FROM SHIP

The ship is equipped with thirty-six lifeboat pods which can be ejected in an extreme emergency. Escape pods are probably a lot safer if ejected at sublight. After ejection, the pods are designed to dock together into clusters to increase chances of survival (dubbed "gaggle mode"). Additionally, the ship is equipped with four emergency evacuation transporters capable of one-way-only transport off the ship.

EMERGENCY EVACUATION TO SHIP

During times of disaster on a planet or on another ship, *Voyager* is well-equipped to serve as a rescue vessel. Evacuation to the ship can be accomplished by Transporter (in addition to the personnel Transporters, the cargo Transporters can be used in a pinch). The ship's shuttlecraft can also be used for emergency evacuation, but their total capacity is far less than Transporter usage. During such an evacuation, the ship's Shuttlebay can be pressed into service as medical triage facilities and refugee accommodations, as can the Cargo Deck. Total capacity of *Voyager* in an emergency evacuation is probably about 2,000 people.

FIRE

In case of fire on board *Voyager*, sensors immediately detect the change in temperature and air ionization. A forcefield is activated, containing the fire, sealing it off from

further oxygen supply. This extinguishes most fires very quickly and with a minimum of damage. Handheld and other extinguishers can also be made available. As a last-ditch effort in the case of a major disaster, one or more sections of the ship can be vented into the vacuum of space, cutting off the fire's oxygen supply. This will probably be hazardous to the health of any crewmembers unlucky enough to be in the area.

ATMOSPHERIC SUPPLY FAILURE

The *Voyager* environmental support systems are highly sophisticated, multiply redundant, and very rarely subject to any significant problem. Even in the event of total loss of power to both air supply subsystems and the backup system, there is sufficient air volume in the ship's interior to sustain the crew for many hours. Minimum power to ventilator fans could easily extend this for days, even without any new oxygen supply. In the event of a sufficiently severe systems failure, nonessential areas of the ship would be evacuated, and the crew would take refuge in a number of designated emergency environmental support shelters. Crew members working outside of these areas would probably have to don environmental suits. A catastrophic loss of pressure in the ship (as might happen if the hull were breached) would likely be limited to a very small section of the ship because isolator doors would automatically seal off the damaged area. In most cases, a forcefield in the hull would temporarily stop the leak until the crew can actually repair the hole.

INERTIAL DAMPING FAILURE

Voyager travels at such tremendous speeds (even when under impulse power) that the acceleration and deceleration involved would instantly turn our crew to chunky salsa unless protected by the Inertial Damping Field. Should this system (and its backups) fail, the ship would be limited to very gentle speed changes (compared to what it ordinarily does).

It would take many months for the ship to accelerate to Warp One, or to change warp factor. This would mean that the ship would be essentially trapped at whatever speed it is travelling, for any significant speed change would take a very long time or would kill the crew and severely damage the structure of the starship.

WARP FIELD COLLAPSE

When travelling at warp speed, *Voyager* is presumably enveloped in a warp field which suspends the ship in a bubble of subspace. In other words, the ship is partially existing in another universe. In order for the ship to return to "normal" space, the subspace field generators must be powered down in a properly synchronized sequence. This is not ordinarily a problem (in fact, it is possible to simply "turn off" the generators, and the residual field collapse will normally be safe). On the other hand, should the fields collapse in an unsynchronized sequence, it is possible for different parts of the ship to be travelling at different warp factors. The result would be that the subspace field stress would immediately shred the ship and its crew.

PLANETARY LANDING

Voyager can theoretically be maneuvered into the atmosphere of a Class M planet and (hopefully) safely landed. The structural strain of landing would be absorbed by the Ground Hover Footpad System, a set of four stabilization pads which work in concert with the warp engines to suspend the ship over the terrain. The USS *Intrepid* has practiced this delicate maneuver under controlled conditions, but has not yet powered down the suspension field and allowed the full weight of the ship to compress the ground. At most, the stresses would be akin to supporting a *Nimitz* class aircraft carrier or Trident submarine on its normal drydock.

WARP CORE BREACH

One of the worst imaginable accidents in an antimatter reactor, the breach of the reaction vessel, exposing the ship to antimatter plasma and other high-pressure, high temperature gasses. In such an accident, a number of emergency safeguards automatically activate. First, a cylindrical forcefield is activated, isolating the engine from the rest of Engineering. Second, an emergency shutdown procedure automatically shuts off all fuel feeds and magnetic quenching fields are activated. Should these fail to work, a series of explosive bolts blow off a hatch on the bottom of the Engineering Hull and the entire warp reactor core is ejected into space. This will result in venting much of the Engineering Hull to the vacuum of space and the probable death of a significant number of engineering personnel. Additionally, without the warp core, the ship will be limited to impulse speed, until repair crews can transfer the Reserve Warp Engine Core from its storage bay, and into the normal structural mount. The ejection procedure can prevent the loss of the entire starship in the event of a catastrophic loss of antimatter containment. (Note: This is

probably similar to what happened to the USS *Yamato* in the episode "Contagion", except that the safety procedures failed and the ship blew up.)

ANTIMATTER CONTAINMENT FAILURE

Equally dangerous as a warp core breach, this indicates a failure in the magnetic containment fields which isolate the volatile antimatter fuel from the rest of the ship. Should even a tiny quantity of antimatter come into contact with the "normal" matter in *Voyager*, the resulting explosion could very easily destroy the ship. Many backup power supplies and magnetic field generators exist to insure that such an accident never happens, but it is remotely possible. If such an accident occurs, the antimatter fuel supply can be vented into space. Emergency shutdown of the warp engine would be performed, and forcefields would attempt to contain the extent of any antimatter annihilation explosions. In a severe accident, explosive bolts would blow another hatch on the bottom of the Engineering Hull and the antimatter storage pods would be ejected. (This is one reason why antimatter storage is located at the bottom of the Engineering Hull.) This procedure is somewhat similar to procedures invoked during a warp core breach.

SECTION IV: A CELESTIAL BESTIARY

Over the course of the past seasons, our writers have frequently been called upon to devise various exotic-sounding planetary and stellar phenomena for our heroes to explore and to sometimes be threatened by. Since this need seems likely to continue, we herewith present the Star Trek Celestial Bestiary of weird, dangerous, but scientifically semi-plausible phenomena. We hope that these might serve as springboards for our writers' imaginations. This Bestiary is divided into three sections: Planetary phenomena, stellar phenomena, and interstellar phenomena.

Please note that many of these objects and phenomena, some of which have already been depicted in TNG/DS9 episodes, are based on actual scientific theory, though a few are pure figments of the imagination. If you're contemplating using any of these in a story, we would be happy to discuss them at greater length. (Thanks to Dana Berry of the Space Telescope Science Institute, and Steven Agid and Brian Young of McDonnell Douglas Space Systems Company for additional scientific material.)

PLANETARY PHENOMENA

These are things associated with planets and solar systems. In the astronomical scheme of things, these are pretty small, but they are often of the most interest to our human space explorers. Unique items already seen are marked "Used."

comets dislodged from an Oort Cloud: Yet another form of gravitationally induced threat. Many solar systems apparently have a large belt of frozen comets orbiting far beyond the planets' orbit. It is possible for some passing object to gravitationally "knock" a large number of these comets out of their distant orbits, to fall toward the sun. If this happens, it is possible that a number of these might hit one or more of the planets in the solar system. Such an occurrence is one theory to the disappearance of Earth's dinosaurs.

Class M planet: In *Star Trek* astronomical parlance, this is a planet which approximates conditions of our own Earth, and is thus suitable for the support of humanoid life. Most *Star Trek* stories involve Class M planets, especially when our people have to beam down to the planets' surface.

destruction of a moon from tidal stresses: This might result in a new ring around the planet. Among planets with several moons, it is not uncommon for the gravity-induced tidal stresses between the moons and the planet to cause one or more of the moons to be torn apart, resulting in the creation of Saturn-like rings. This would certainly be a hazard to anyone living on that moon, or to a spacecraft in orbit near the moon. Additionally, it is possible that the moon's disintegration could cause an increase in meteor activity on the planet's surface.

gas giant planet: Several planets in our own solar system are Gas Giants, like Jupiter. Such planets tend to be characterized by poisonous atmospheres of methane and hydrogen, relatively high gravity, the absence of any stable surface, and very high magnetic fields and radiation belts. These latter two items are not a threat to *Voyager* under normal conditions because of its powerful (and normally very reliable) shielding systems. On the other hand, in the unlikely circumstance that those shields should fail....

ionized gas torus: A volcanic moon, (again, like Io orbiting Jupiter) can create a doughnut-shaped cloud of very tenuous gas along its orbital path around the mother planet. Such a gas torus can become ionized from the planet's magnetic field, and could interfere with the function of a starship's sensors.

near-collision of two planets: Another form of interaction between two planetary bodies might be a near-collision in which one or both planets is gravitationally slingshotted out of the solar system. This is a very unlikely occurrence in a stable system, but would certainly be unwelcome news to anyone living there.

panspermia: A theory suggesting that primitive microbes exist throughout the universe, and that life on Earth and other planets came from these microbes.

planetary nebula: A large, swirling, pizza-shaped cloud of dust and gas, which is a solar system in the making. The gases near the center may eventually compress enough to form a star, and the stuff around it may eventually coalesce to form planets. There is a planetary nebula in the main title sequence of our series.

planetary tidal stresses: When a planet is in an orbit near a star, another planet, or a moon, the gravitational stress can cause tides, much as we have in Earth's oceans. If the tides are sufficiently great, it is conceivable that the stresses could affect the planet's structure — possibly enough to eventually tear apart the planet.

protoplanet: An embryonic clump of gases and dust forming in a planetary nebula, a planet in the making.

ring system: Some planets, like our own Saturn, have beautiful rings orbiting them. Such rings seem to be composed of billions of small rock or ice fragments. It is possible that some rings are formed when a planet's moon is torn apart by gravitational or tidal stresses.

super-Jovian planet ignition: Imagine a gas giant planet, about 75 times the mass of Jupiter. If it should happen to collide with another Trans-Jovian planet (about ten times the mass of Jupiter), it would become heavy enough for gravity to cause the planet to suddenly begin fusion. In other words, the planet would become a small star (to the great annoyance of nearby property owners). Used.

volcanic plumes: Some small planets and asteroids have live volcanoes on their surface. In some cases, (like the moon Io, orbiting Jupiter) the volcanoes are powerful enough and the planet's gravity is weak enough that it can create a plume of ash and gasses rising hundreds of kilometers above the surface. Such a volcano could conceivable threaten a small spacecraft in a low orbit.

STELLAR PHENOMENA

These are some of the things that happen over the lifetime of various types of stars.

accretion bridge: A stream of material, usually hot plasma or gasses, that can flow from one star in a binary pair to its companion star. (See "Evolution.") See also: binary star pair.

accretion disk: A frisbee-shaped agglomeration of gases and material found around one of the stars in some binary star systems and around supermassive black holes.

antimatter star: Or an antimatter nebula. Possibly originating from outside our galaxy, it is possible that an entire star could be composed of antimatter. If the entire star and its planets were pure antimatter, it would have a perfectly normal existence unless it came into contact with something composed of "normal" matter. Like *Voyager*. Possibly more insidious would be a gas cloud or nebula composed of anti-hydrogen. Although very thin (like a regular nebula), such a cloud might cause severe erosion of the ship's hull as it flew through.

binary star pair: Many stars in our galaxy are what we call binary pairs. That is, they orbit each other. In some such binary pairs, the gravity of one star is so great that it actually pulls gas from the other star's photosphere. These streamers of ionized gas would be very spectacular and would be a threat to any spacecraft or planet in the vicinity. Used.

binary star, cataclysmic: A binary star system which undergoes violent periods of nova outbursts caused by one star passing too close to its companion.

binary star, contact: A pair of stars orbiting so close to each other that their inner atmospheres touch.

bipolar outflow: A stage in the formation of young stars in which streams of material are ejected from the north and south poles of the star. Also associated with cataclysmic binary stars and supermassive black holes.

black dwarf: The cold, burnt-out remains of a white dwarf star. Believed to be one of the oldest types of objects in the universe.

black hole: One of the most fearsome objects in nature. This is a dead star which was once larger than our Sun. After it burnt out, it gravitationally collapsed onto itself. So powerful was its gravity that it finally collapsed into an object smaller than an atom's nucleus. The resulting "black hole" is so-named because its gravity is so great that even light cannot escape. Near a black hole, this incredible gravity also causes terrible tidal stresses—more than enough to tear a planet or a starship to shreds. There would also be very severe (and probably dangerous) time/space distortions near the black hole. A wandering black hole is very capable of swallowing entire solar systems. (Note: It is very unlikely that any object or ship could survive falling "through" a black hole — it would be torn into subatomic particles by the gravitational stresses.)

blue stragglers: A hot, massive, bright blue star found in the core of some globular star clusters, formed by the head-on collision of two red giant stars.

blue variables: Also known as Luminescent Blue Variables, these are unstable, blue giant stars which are extremely massive and very short-lived.

Cepheid variable star: An unstable star whose brightness varies considerably over a relatively short period of time (days). These tend to be rather large stars whose surface can trap the star's internal energy output until it builds up to a point where it erupts in a potentially dangerous burst. A related object is a "flare star" which can increase in brightness for periods as short as minutes.

flares, solar: Sudden bursts of energy from the surface of a star. Usually associated with sunspots and prominences, they are often accompanied by powerful magnetic fields.

Lazarus star: A star that has exploded as a supernova, but somehow survives and expands into a second red giant phase, then collapses again and explodes as a second supernova. These stars are often in the center of several nested layers of gas, ejected from previous supernova explosions.

non-radial pulsators: A type of star with huge tidal waves of hot plasma racing across their surfaces, causing irregular pulsation below the surface.

pulsar: The dying embers of a large collapsed star. It rotates rapidly, sending a powerful jet of potentially dangerous radiation, thereby appearing to pulse at several times a second. Imagine a spinning searchlight, sending out a powerful beacon of radiation. (*Voyager* shields might not be able to protect the ship at a sufficiently close range.)

red giant star: A star which has become very bloated toward the end of its life. Some red giants are bright, some are dim, but all are relatively cool in temperature. Some red giants ultimately collapse and explode, becoming supernovas.

runaway star: A star which, due to gravitational oddities associated with its birth, is moving through the Milky Way Galaxy at relatively high (sublight) speeds.

shell star, B-type: An unstable star of spectral type B that sporadically puffs off shells of gas.

stellar fusion ignition: The birth of a star. As suggested above, it is possible for a nebula or other gas cloud to (over millions of years) coalesce into a swirling whirlpool. This can eventually condense into a dense central object which can become hot enough to ignite into a new star. The leftover "debris" from such a star's formation can form planets. Although this process is extremely protracted, it is possible that our ship might arrive at such a gas cloud just in time to witness (and be threatened by) the star's birth.

supernova: A star near death, which has exhausted almost all of its nuclear fuel. Lacking the ability to sustain itself, it collapses, triggering one final massive explosion. A sufficiently large supernova could very easily wipe out any inhabited planets in a solar system. The x-rays from a supernova could even threaten life in a solar system several light-years away. If the star was massive enough to begin with, it could ultimately collapse into a black hole. Out of the ashes of the supernova explosion can come the heavier elements which form the building blocks of life. Many of the atoms in our bodies were formed billions of years ago in such an explosion.

white hole: A hypothetical entity, some kind of opposite of a black hole from which radiation and matter appear to originate from nothingness.

INTERSTELLAR, GALACTIC, AND OTHER STUFF

These are some of the things that our ship may run into in the great void between stars. These are also some of the phenomena associated with the structure of our Milky Way Galaxy itself.

background radiation: A very low level radio signal that seems to permeate the entire sky. This is a distant echo of the original Big Bang in which the universe was created. This radiation is pretty harmless, but it is something that our people may well continue to study in the 24th century in search of clues to the early moments of the universe.

dark matter: Current scientific theory suggests that our galaxy may contain vast quantities of "dark matter" in the spaces between the arms of the galaxy and in the regions around its perimeter. If this stuff exists, it is probably very tenuous, but its total mass may be ten times greater than the visible galaxy.

density wave: Believed to emanate from the center of the galaxy, density waves, over millions of years, "herd" stars into the spiral arm structures seen in galaxies. Their source is unknown.

Dyson Sphere: Postulated by physicist Freeman Dyson, this would be an incredibly large structure built by some advanced culture. The sphere would completely enclose a star, harnessing the star's total energy output. A Dyson Sphere would easily be 200 million miles in diameter, dwarfing any other artificial construct we've yet seen on *Star Trek*, and would presumably have been built for some incredible purpose that

our writers will devise. This could be detected by infrared waste heat emissions that would probably leak through the sphere's surface. Used.

galaxy, center of: The center of our galaxy is believed to be a very dense cluster of stars... a very spectacular sight to those used to the relatively sparse starscape visible from Earth. The relatively high density of the star population means that starship navigation is probably somewhat trickier than normal (though well within the abilities of our people and hardware), and radiation levels would probably be quite a bit higher. There may be a large, dangerous black hole at the very center of the galaxy. The movie *Star Trek* established that there is a mysterious and dangerous energy barrier around the center, where Kirk and company discovered the mythical planet, Sha-Ka-Ree. See also: Great Annihilator and Sagittarius A.

galaxy, edge of: The first *Star Trek* series established that there is a mysterious energy barrier at the edge of our galaxy. This unexplained force is a spectacular curtain of shimmering energy, very dangerous to both ship and crew. Beyond the edge of our galaxy is a vast intergalactic void, millions — even billions — of light years to other galaxies.

gravity waves: Some scientists believe that gravity is transmitted through space by means of gravity waves. This is thought to be similar to electromagnetic waves (like light), gravity waves are released when there is either a sudden acceleration of an object or a sudden shift in the distribution of a mass. If this is the case, one might imagine some bizarre phenomena in which two sets of gravity waves somehow intersect, possibly causing strange (and probably dangerous) spatial distortions.

Great Annihilator: An unknown, massive object believed to exist near the core of our Milky Way Galaxy. This is a powerful source of gamma ray radiation which is believed to be created by the collision of prodigious amounts of electrons and positrons (antimatter). The source of this antimatter is a mystery. So called because the electrons and positrons are annihilated when they come into contact with each other, causing a release of energy not unlike that harnessed in our warp engine core.

maximum entropy: The death of the universe as we know it. Current theory suggests that at an almost unimaginably distant time in the future, the energy in the universe will be spread equally across the cosmos. When there are no temperature differences, there can be no chemical or nuclear activity, and the universe will be effectively "dead". There is another theory which suggests that rather than "dying" at maximum entropy, the universe will collapse back onto itself to form another Big Bang, starting a whole new universe.

nebula: A large, tenuous cloud of interstellar dust and gas. Often the remnants of an exploded star or a solar system in the making. Although very thin, the dust and gas can be a hazard to the ship when travelling at high impulse (sublight) speeds. This is similar to reentry into the Earth's atmosphere causes severe friction heating on the Space Shuttle. If the nebula is near a star, it could glow with the star's radiation, quite a spectacular sight, but possibly impairing the ship's sensors.

Under certain conditions, a nebula can coalesce into a whirlpool which can become a new solar system.

negative matter: Not the same thing as antimatter. Negative matter would theoretically have the same properties as "normal" matter, except that it would have a gravity field which pushes away rather than attracting. When negative matter and positive matter come into contact, they would theoretically annihilate each other, but with no release of energy. Both particles would simply cease to exist.

proto-universe event: A hypothetical occurrence in which another Big Bang is occurring in a parallel universe, but somehow intrudes into ours. There would be severe space/time distortions accompanied by the release of a tremendous amount of energy and possibly some "new" matter created by the parallel Big Bang. Used.

rogue star cluster: A globular cluster that's been gravitationally torn apart by passage through the galaxy. Most of it will go harmlessly through the galaxy, a relatively small number of stars could pass close enough to the heart of the Federation to whip a number of entire solar systems out of the galaxy. This could take place over a relatively short number of years, even though we would probably see the approaching cluster from Earth today.

Sagittarius A: A strong source of natural radio signals at the center of our Milky Way Galaxy. There is no known association with the Great Annihilator.

star cluster: A clump of stars, drawn (relatively) close together by gravitational attraction. Relatively high levels of radiation and relatively high concentrations of interstellar gas can be found in these areas.

strings, interstellar: Also called "super strings". Incredibly long gossamers of incredibly dense material. One theory describes them as a black hole that's one proton in diameter but light-years long, and virtually undetectable at a distance except by its intense gravity. If a ship were to fly through such a string, it would cut the ship neatly in half. If it got entangled in a solar system, it could slice the planets and star into pasta. If a way could be found to manufacture or control these objects, they could make a very potent weapon or defensive system. Used.

subspace: A hypothetical spatial continuum (maybe a parallel dimension?) in which *Voyager* and other starships exist when at warp drive. The laws of physics are somewhat different in subspace, making it possible to go at the speed of light, which is impossible in our reality.

subspace anomaly: When *Voyager* is travelling at warp speed, it is presumably not entirely in normal space (where faster-than-light travel is impossible), but in a hypothetical domain called "subspace". It is conceivable that subspace is not a uniform continuum, but that it has mysterious "anomalies" — density variations, field vortices, or other such things. These might be difficult to detect but could be very dangerous to the ship at warp speed.

Von Neumann Machine: Postulated by mathematician John Von Neumann, this is a concept of a semi-intelligent

machine which is built to (1) find raw material, and (2) make copies of itself. Such devices could conceivably "eat" an entire planetary system, much as a virus can consume a host body. Von Neumann machines could be built for massive terraforming of an uninhabitable world, as homes for colonists, or as a terrible, self-replicating army of destruction.

wormhole: A hypothetical "tunnel" through the structure of space. One would enter the tunnel and apparently travel a relatively short distance, emerging much further away. This would probably be a subspace phenomenon somehow related to our warp drive. The *Star Trek* features have established that a warp drive malfunction can pull the ship into a dangerous wormhole. In the *TNG* episode "The Price" we have seen that most natural wormholes are very unstable, with both endpoints fluctuating wildly in both time and space. Used.

VOYAGER UPDATE: As we know, the wormhole has become a familiar object in the *Star Trek* universe. Deep Space Nine guards the Bajor-to-Idran artificial wormhole, the express route across 70,000 light-years of space to the Gamma Quadrant.

Now, with *Star Trek: Voyager*, we find that the Caretaker aliens have created a similar length of wormhole through which they have pulled starships from the Bajor neighborhood to the distant Delta Quadrant.

The USS *Voyager* will find it extremely difficult, if not impossible, to traverse 70,000 lightyears without some shortcut. Even if the starship could maintain Warp 9.99, it would still take some 75 years to get home.

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Yes, but which button DO I push to fire the phasers?

